ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, MARCH 18, 1916. No. 12.

EDITORIALS

THE ELECTRIC GOAT.

The trials and tribulations of the manager of a central station are many. To be successful in his work, he must satisfy four classes of people; his employers, who are the stockholders of the company, his employees, his customers and the public to whom he is indebted for his franchise. To meet all of these obligations is no easy task, and yet it is worth his while to endeavor to meet the obligation at every contact. If the owners of the company are not satisfied, it goes without saying that the manager will soon be looking for another position. If employees are not properly handled, there will be dissatisfaction and friction and a lack of efficiency in carrying on the operation of the enterprise. Unless employees are embued with enthusiasm for their work; unless they are thoroughly organized; and unless they are trained to work with intelligence and good judgment, the work will not run smoothly and efficiently. To achieve these results, good working conditions, human sympathy and fair pay are essential. Every precaution must be taken to avoid accidents both for the good of the employees and from a financial standpoint.

In his contact with customers, the manager must be ready to meet all kinds of complaints, whether they are justified or not, and convince the customer that he is doing everything possible to give good service. In the words of Mr. E. A. Bechstein, of the Sandusky Gas & Electric Company, in a recent address to the students of the Case School of Applied Sciences, a central-station manager must be the "electric goat." He must maintain a courteous attitude toward both customers and public in spite of the many causes for irritation which he meets. He must use tact and diplomacy in upholding friendly relations, and this involves a study of human nature and of the sentiment of the community in which he works. He must be a good fellow under all conditions.

On the other hand, when all of these demands upon him are successfully met, there is satisfaction in having mastered the situation; in being able to give good service, to retain faith, to maintain good control in the face of all difficulties, and to inspire his staff with a desire to keep up the good work. The public is a hard taskmaster or any easy one according, very largely, to whether the manager makes it the one or the other. The willingness to give a square deal is an American trait and when properly handled, an American public can at a critical time be depended upon to support the man who they believe has been doing the right thing by them. But to instill this feeling, it is not only necessary to have done so, but to have let the people know it. Good-will advertising is one way of accomplishing this, and another is to have frank and fair dealings with the public and let them know what the utility company is doing to give good service and to improve it when and where possible. An attitude not only of fair dealing, but of publicity for the affairs of the company, goes a long way towards making the relations with his public pleasant and cordial.

ELECTRIC STEEL FURNACES.

The use of the electric furnace not only for refining steel but for melting the steel in making small steel castings is being rapidly extended, and offers to the central station a field for business which is inviting on account of its excellent load-factor and the large blocks of energy used. The number of such furnaces operated in the United States was increased to such an extent during 1915 that this country now leads the world in number of installations. The electric furnace is in demand not only for making the special alloy-steels so largely required in automobile and aeroplane construction and other special uses, and which bring high prices, but also for the production of steel castings of ordinary analysis which are free from the blowholes so often resulting from the older processes. The electric furnace is useful not only in eliminating the solid impurities but in getting rid of objectionable gases.

The arc type of furnace seems to be the most generally used, and the Heroult model leads all others, and constitutes over one-third of the total used in all countries. Germany at present occupies second place in number of furnaces in operation, but electric furnaces are being rapidly installed in England, no less than thirty new ones being placed in operation in 1915 for the melting of steel. Other countries also are showing an appreciation of the advantages of electric melting, and Russia, which is not distinguished for its manufacturing developments, is said to have eleven already installed.

Several models of furnace have been constructed in this country, whose design is based upon a study of heat losses, and whose efficiency consequently compares very favorably with the older designs, whose aim was primarily to get results. Such refinements of design, especially for small operations, should help to introduce the electric melting furnace in many

mills where economy is an important consideration. The attention of the central-station solicitor may well be given to a survey of his field to ascertain where opportunities exist for installations of this kind. Undoubtedly much new business only awaits suitable cultivation.

REDUCING ELECTROLYSIS.

A very large percentage of the electric street railways in this country make use of the track for a return circuit. This results in a considerable amount of stray current, which finds its way back to the power house through the earth or through metallic structures in the earth, such as water and gas pipes and cable sheathing. In certain places the stray currents have caused electrolysis to such an extent as to do considerable damage. Pipes and cable sheaths are not only found to be badly pitted, but in some cases have been eaten entirely through. Since the prevention of such electrolytic corrosion is not essential to operation of an electric railway system, it has often been neglected and remedial measures have not been taken until considerable damage has been found to have taken place. One method of reducing the electrolytic corrosion which would be easy of application has not been used at all. This consists in the reversal of polarity in the street railway systems. Such reversal, if made, say, every 24 hours, would greatly reduce the amount of corrosion produced by leakage currents. This fast has been known for many years, but is again brought to attention by one of the papers presented at the meeting of the American Institute of Electrical Engineers, which took place last week in New York City.

This paper, the authors of which were Messrs. Burton McCollum and G. H. Ahlborn, described work which has been carried out at the Bureau of Standards to determine the amount of electrolysis, both with alternating currents and with continuous currents which are reversed at various periods ranging from a minute up to two weeks. It was found not only that corrosion is negligible with alternating currents, but that it is greatly reduced by the periodical reversal of a continuous current. If such a current is reversed weekly, it offers considerable protection to iron pipes as compared with the amount of electrolysis which would take place if the current flowed continuously in one direction. Reduction of corrosion in lead cable sheaths can be effected if the reversal occurs more frequently. A reversal once a day will reduce the amount of electrolysis to perhaps one-quarter of what would be produced with unidirectional current, but the protection to lead is not as great as to iron pipes. It is advisable, consequently, that lead cable sheaths should be drained at least to some extent in order to prevent their corrosion by electrolysis.

The use of insulated negative return feeders for electric railway circuits is generally recognized as an advantage. It not only helps to reduce electrolysis by lowering the drops of potential experienced along the railway track, but in some cases results in a saving of power on account of a lower resistance in the return circuit. It is frequently found that there is a reversal of polarity between underground structures and track with different conditions of load on a railway system, and a condition of this kind produces much less damage by corrosion than would result where the polarity was constantly in the same direction.

This paper serves to emphasize the fact that there is very little, if any, danger to water pipes due to making grounds upon them from the neutral wire of an alternating-current system. With the frequencies in general use the amount of electrolysis which may ensue, even where conditions are such as to produce a current from pipe to ground, is not more than one per cent of what would occur with the same value of current in a continuous-current system. Similarly, there is little danger from alternating currents to gas pipes or lead cable sheaths from this cause, but what danger may exist is rather from the possibility of sparks or arcing due to poor contacts. The trouble which does arise on cable sheaths from stray railway currents is usually due to the concentration of the corrosion at individual points where good contact to ground is made by the presence of water or other conductor. Pitting is thus produced by the localized action and may eventually make trouble by eating a hole entirely through the sheath. Since cable sheaths are continuous and do not involve insulating joints as may occur in piping systems, it is almost always found advisable to electrically drain such sheaths as recommended above.

MAKING POLES ATTRACTIVE.

The wooden poles used by telephone, electric railway and electric light companies for overhead wires are usually regarded as eye-sores and in this respect are worse offenders than poles of other character, such as steel or concrete. This is probably due to their lack of symmetry, their surface characteristics and their lack of decorative elements. Wherever feasible, attempts are made to get rid of them by placing wires underground and by the joint use of poles by the different companies, thus reducing the number necessary.

A movement has lately arisen for detracting from the unsightliness of these poles in a direction which may lead eventually to making them objects of beauty. In White Plains, N. Y., and in Wallingford, Conn., the experiment has been adopted of planting rose bushes of a climbing variety at the foot of the poles. Certainly if a pole can be covered by a blooming plant, an ivy vine or other attractive vegetation, its appearance along the street will be greatly altered and its objectionableness would be very much lessened.

One objection that might be raised to such a procedure is that owing to the presence of the vine, mois-

ture will be retained upon the surface of the pole and will accelerate the rotting. Since, however, the life of a pole is nearly always limited by rotting of the butt, it is not likely that any deterioration that might thus be induced above the surface of the ground will appreciably lessen the life of the pole, and consequently this objection need not be given a great deal of weight.

SIMPLIFYING MEASUREMENTS.

The electrical industry has from the start had an advantage shared by few others, due to the adoption of a system of electrical units having a simple relationship to each other, and international trade has been facilitated by the fact that these units are not confined to our own country, but are common to the civilized world. This condition probably owes its existence to the fact that the electrical industry has grown out of electrical science, its fundamental developments and especially its methods of measurement being due almost entirely to scientific men. This is in contrast to most engineering work and to most industries. The electrical and magnetic units bear a relation to metric units which is more simple than their relation to the English units in common use, and matters would be still further simplified if the electrical industry had generally adopted the metric units, but this unfortunately has not been the case. There is a well defined movement to substitute the kilowatt for the horsepower and perhaps other changes of equal desirability will be brought about in the course of time.

While the measurement of temperature is not directly connected with the measurement of mechanical quantities, there is nevertheless, a choice here also between the more simple and rational, and the less rational system. The centigrade scale of thermometry is in common use by electrical engineers, but the use of the Fahrenheit scale persists for general purposes. A bill is pending before the present Congress to make the use of the centigrade scale compulsory in government publications, and electrical engineers will generally recognize the advantage in taking a step of this kind. Many of the government departments are already following this practice, but others, such as the Weather Bureau, hesitate to make the change. If the weather reports were given out in terms of the centigrade scale, it would soon become familiar to the public, and when once well known there could be little doubt that it would come into general use. Similar action upon the metric units of weight and measures has been defeated in the past, but may come to the front again in the near future. The trying times brought about by the European war are impressing upon the English people the difficulties under which they labor in using an unscientific system of measures as well as of money. Proposals are being widely and seriously made in that country both for adoption of the decimal system of coinage and for the adoption of the metric system of measurements. Even as conservative a body as the British Electrical and Allied Manufacturers' Association has taken action urging that a government inquiry should be instituted as to the desirability of adopting both the above systems. The use of a simple system of units should make electrical engineers even more than others cognizant of the advantages of a simple system, but the contrast of the American monetary system with that of Great Britain should make evident to any one the advantages which would accrue from the use of a decimal system in all kinds of measurements.

DEPLORABLE LOOSENESS OF SPEECH.

It will be generally admitted that a great many human misunderstandings arise from a failure of individuals to make known to others their desires and thoughts. This may arise from reticence, lack of communication, or inability to give proper expression to ideas or to understand them when properly expressed. Thus, differences of language are often responsible for misunderstandings between nations or entire races of people. It is reasonable to believe that most wars would be avoided if all of the people understood the ideals and motives of their opponents.

Among scientific men accuracy in the expression of ideas is to be expected to a greater extent than among other people, since scientists are trained to accuracy in measurement and in thought. It is most lamentable when the lack of accuracy in expression gives rise to misconception of scientific facts and natural laws. Yet this occasionally takes place under circumstances which are entirely avoidable, if proper care were used in stating natural phenomena. Electrical science is not entirely free from instances of this kind and another example has just come to hand.

The leading article in the last issue of the *Bulletin of the Bureau of Standards* is entitled "Calculation of the Maximum Force Between Two Coaxial Circular Currents." This gives repetition to an idea frequently found in textbooks, but which is entirely at variance with fact. Force exists between conductors which carry electrical currents, but not between the elements of current themselves. If the latter were the case, a continuous current would not be distributed uniformly over the cross-section of a conductor and the conductance would consequently not be proportional to the area of cross-section. The incorrect statement of this relationship may naturally lead one not already informed on this matter to entirely incorrect conclusions, and such looseness of expression is greatly to be deplored. It is all the less excusable in the present instance because attention was called several years ago to this particular case by Dr. Carl Hering. This is not the only inadvertent statement of an intended truth in a misleading way in scientific articles and too much care cannot be taken to insure their exclusion from textbooks and other publications. Cannot the Bureau of Standards set an example, if not indeed a standard, of accuracy of scientific expression?

Happenings in the Industry

Plans for America's Electrical Week—Compromise Ends Philadelphia Valuation Case—Monthly Meeting of American Institute—Geographic Society Honors Vail and Carty—Final Report on Dallas Situation—Annual Report of Bell System Shows Gains—Northern White Cedar Production—Convention Programs of Southwestern and Minnesota Associations

Plans for "America's Electrical Week," December 2 to 9.

"America's Electrical Week" has been selected by the Campaign Executive Committee of the Society for Electrical Development as the official name for the electrical celebration, December 2 to 9, 1916. A start has already been made on the nation-wide campaign which from every indication will surpass even the results accomplished by the 1915 "Electrical Prosperity Week."

The history, and how results were obtained by the different interests during the week of 1915, has been published by the Society in an attractive 52-page book entitled "The Story of the Week," which will be of value as a guide to local committees during the 1916 campaign.

The name "America's Electrical Week" was chosen this year because of its timeliness, the patriotic thought it conveys, the national aspect the name indicates, its euphony, and its appeal to every citizen. The date is practically the same as that of last year, which was generally conceded to be the best time of the year as it began the Christmas drive for big business.

The Campaign Executive Committee which will direct activities of the campaign consists of the following gentlemen:

Representing jobbers: Gerard Swope, chairman, vice-president, Western Electric Company; Frank S. Price, Pettingell-Andrews Company, Boston.

Representing central stations: Charles L. Edgar, president, Edison Electric Illuminating Company, Boston; Joseph B. McCall, president, Philadelphia Electric Company.

Representing manufacturers: Guy E. Tripp, chairman of the Board, Westinghouse Electric & Manufacturing Company; Anson W. Burchard, vice-president, General Electric Company.

Representing contractors: James R. Strong, president, Tucker Electric Construction Company, New York; George Weiderman, George Weiderman Company.

Representatives-at-large: James H. McGraw, president, McGraw Publishing Company; Thomas A. Wynne, Jupiter, Jovian Order.

The Executive Committee has selected the following representative men to serve as an Advisory Committee: W. H. Atkins, E. H. Edkins, H. K. Mohr, George Williams, F. H. Gale, A. K. Baylor, J. C. McQuiston, A. A. Brown, N. H. Boynton, J. E. Livor, E. W. Rockafellow, P. L. Thomson, T. J. McManis, T. G. Whaling, J. R. Strong, J. R. Galloway, George Weiderman, T. A. Wynne, F. M. Feiker, A. A. Gray, F. B. Rae, Jr., E. E. Whitehorne, H. W. Alexander, J. T. Kelly, Hill Griffith, A. J. Edgell, J. M. Wakeman, chairman.

This committee met at the offices of the Society, March 1, to discuss and take action on preliminary plans for the big movement.

It was decided to have an open poster competition for the best design for the week. America's most prominent artists will be invited to participate. Cash prizes will be awarded for the most appropriate design. The contest will soon be announced throughout the country.

Royalties in Force on Licensed Heating Devices.

Since the publication of an article in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 11, relating the conditions of the licensing arrangement of several manufacturers of heating devices with the Hoskins Manufacturing Company and the General Electric Company, a protest has been made by the manufacturers interested regarding what is an apparent mis-statement with respect to the arrangement in existence for the payment of royalties. In this connection George A. Hughes, president of the Hughes Electric Heating Company, Chicago, one of the leading manufacturers of electric stoves, ranges and other heating appliances, states that royalties have been collected under the license agreement since October 15, 1915. While the payments have been arranged upon a progressive schedule until a full basis of compensation to the owners of the patents shall have been arrived at, the immediate effect has been to affect the standard of prices and the statement above referred to has caused the manufacturers and their salesmen some embarrassment in view of explanations which had already been made to the trade.

Compromise Suddenly Ends Philadelphia Electric Company Case.

The most important case ever brought before the Pennsylvania Public Service Commission, that of the City of Philadelphia vs. the Philadelphia Electric Company, charging excessive rates for municipal and private lighting, was brought to a close on March 9, when it was announced that a compromise had been agreed upon between the plaintiffs and defendants. While the final arrangements must be submitted to the Commission for approval, it is freely predicted that such permission will be readily forthcoming.

The proceedings were originaly brought in October, 1914, and the case heard during the latter part of that year and the early part of 1915, most of the work being spasmodic and of little value in the final determination of the case. However, following the appointment of a new commission in the early part of 1915, it was decided that the case be expedited, and for the past 14 weeks hearings have been held every day. Estimates were made up by Prof. D. C. Jackson for the defendants and by F. W. Ballard for the plaintiffs to show the valuation of the company's property. It had been about decided to admit into the case the valuation of the commission's expert, Milo Maltbie, when the compromise was reached.

The reduction will be based upon the gross earnings of the company for 1915, which were $7,849,267.67, the company agreeing to arrange its new schedules as if it were duplicating the 1915 business, but setting out to earn exactly a million dollars less.

The rates of the company will be reduced about as follows: Residence lighting, 25 per cent; small businesses and manufacturing using both light and power, 20 per cent, and large commercial power customers, railroads and traction companies, no reduction. The city will receive a refund of $150,000 on the 1915 arc-lighting contract and a permanent reduction of $10 on each of its 15,000 arc lamps.

Based on the past income to the company from these classes of consumers, the householders will save about $200,000; small storekeepers and manufacturing plants about $600,000 on light and about $200,000 more on power, and the city about $150,000. In the case of the city the rate was $97.64 per lamp per year for about 3,000 arc lamps connected to the underground circuits; $81.21 per lamp per year for about 1,100 lamps on the overhead circuits, and $80.30 per lamp per year for 740 lamps connected to municipally owned underground circuits.

As a criterion of the views held by financiers on the results of the reduction of charges agreed upon, the stock of the company advanced from 27 to 27⅝ on the Philadelphia Stock Exchange when the compromise was announced. It was reasoned from the results of similar action by other utility companies that the company may experience temporarily reduced revenues, but the ultimate result will be to greatly advance the gross business and profits of the company.

Plainfield Contract for Free Lighting Held As Valid.

The New Jersey Court of Errors and Appeals has handed down an important decision holding that the contract made by the city of Plainfield with the Public Service Electric Company whereby the latter agreed to furnish free lighting for the municipal buildings of the city is valid and enforceable. This decision, while affirming the judgment of the Supreme Court on certain grounds, indicates a reversal of this tribunal's ruling in so far as the important question involved is concerned.

In 1898, the city of Plainfield granted a franchise to the company with stipulations agreed to for lighting the City Hall and other public buildings free of cost. In December, 1913, the Public Service Electric Company served notice that effective February 1, 1914, it would discontinue such service, it being prohibitive by the public utility act of 1911, as undue and unreasonable discrimination. The city contested this cancellation by an appeal to the Board of Public Utility Commissioners which, on April 4, 1914, upheld the city's contention that the free lighting was not a discrimination, and ordered the company to fulfill the terms of the agreement. In an appeal to the Supreme Court, this tribunal reversed the finding of the Commission (March 27, 1915) on the ground that the spirit of the utility act had been violated. The municipality then carried the case to the Court of Errors and Appeals.

This court in its ruling says that the Board of Public Utility Commissioners, in effect, ordered the specific performance of a contract, which is an equitable power exclusively residing in the Court of Chancery; hence, while the validity of the contract was sustained, the city had not sought the proper tribunal to maintain its rights. Concluding, the court holds that the public utility act is prospective and not retroactive, and accordingly cannot operate upon a contract made with the city of Plainfield in 1898, which was concededly lawful when made.

Municipal Operation in Fremont.

An audit of the accounts of the municipal electric light and water plant at Fremont, Neb., has been made by Harold Almert, of Chicago. The audit covers operation in 1913, 1914 and 1915. It is shown that the receipts have not been sufficient to properly provide for depreciation and taxes. Thus in 1915 gross income was $65,555; operating expenses, $46,742; interest of debt, $6,499; leaving only $12,314. Depreciation is estimated at $11,507 and taxes at $3,489. Merchandizing operations have been conducted at a loss of $2,413. There is thus a deficit of $5,094. Outstanding accounts due from customers and awaiting collection amount to $23,091.

ELECTROLYTIC CORROSION OF PIPES AND CABLE SHEATHING.

Monthly Meeting of American Institute of Electrical Engineers.

The corrosion of both iron and lead by electrolysis is negligible for alternating current and for direct currents which are frequently reversed. This is the most important conclusion reached by the authors of the paper entitled "The Influence of Frequency of Alternating or Infrequently Reversed Current on Electrolytic Corrosion," which was presented at a joint meeting of the American Institute of Electrical Engineers and the New York Section of American Electrochemical Society, which was held in New York City on the evening of March 10. Other conclusions of the authors, Burton McCollum and G. H. Ahlborn, were as follows. The corrosion of both metals decreases with the frequency of reversal of direct current. For lead the corrosion reaches a maximum value with a frequency of reversal lying between one day and one week. For iron, the maximum is not reached until the period exceeds two weeks. The reduction in corrosion with reversed currents appears to be due to the fact that the corrosive process is itself reversable. In the neutral zone of street railway networks, where pipes are continually reversed in polarity, the damage is much less than would be expected from the current values. The algebraic sum of the currents discharged is the best index to the damage. The corrosion of lead with direct current is found to be only about one-fourth the amount indicated by the electrochemical equivalent.

The meeting was opened by President J. J. Carty and the paper was presented by Mr. McCollum. The results given were from experiments carried on at the Bureau of Standards at Washington, D. C., and the paper gave many detailed results of the experiments.

The discussion was opened by Philip Torchio, who pointed out that water companies need have no fear from the grounding of neutrals of alternating-current circuits to their pipes. He expressed surprise that street-railway engineers had not already made use of the advantage of reversing polarity on railway circuits, as similar results had been pointed out in 1902 by A. Larsen.

Alexander Maxwell expressed regret that lower current densities had not been used in the experiments, as this factor is likely to affect the amount of electrolysis, and lower values are the rule under practical conditions. Albert F. Ganz also raised this point, especially with reference to the lead sheathing of cables. He thought the corrosion might be higher in other types of soil. Since cable sheaths are usually destroyed by localized pitting, the danger in practice would not be as small as indicated in the paper. He did not regard it as proved that the corrosive action is reversible.

J. L. R. Hayden disagreed with certain conclusions of the authors and pointed out that ordinary chemical corrosion is a serious source of error in electrolytic experiments. The apparent low value for corrosion of lead may be due to the assumption that lead is bivalent, when the actual valence is four. He had found, like the authors, that iron is more erratic than lead in its behavior.

S. M. Kintner, C. B. Martin and Asa P. Way, gave the results of experiments upon this subject which they carried out. The latter had altered the polarity of pipes by regulating the drop in return feeders through the intermittent insertion of resistance. Mr. Martin had found steel embedded in concrete to be protected by it. L. W. Chubb and Thomas Spooner gave the results of some tests upon corrosion with different frequencies of alternating current. In general the results agreed with the authors. The paper was also discussed by Carl Hering and Thomas M. Roberts.

Colin G. Fink then occupied the chair during the presentation of a paper by William H. Walker entitled "Electrolytic Corrosion of Metals." In the absence of the author, this paper was presented by William K. Lewis.

Electrolytic Corrosion of Metals.

Professor Walker deplored the rather general lack of a clear conception of the mechanism of natural corrosion on the part of electrical and mechanical engineers due in a large measure to their tardiness in availing themselves of the knowledge of the phenomena now at their disposal. Eight years ago, the author advanced the theory and proof of the function of oxygen in the corrosion of iron. Corrosion is an electrolytic phenomenon and takes place at ordinary temperatures only in the presence of water. Metallic iron electrically neutral interacts with two hydrogen ions present in the water which carry electrical charges and produce iron ion which takes up the two electrical charges from the hydrogen ions and deposits two atoms of hydrogen.

The factors which influence the corrosion are: (1) The solution pressure of iron. When this is practically nil, as in the case of iron immersed in chromic-acid solution, corrosion does not take place. The solution pressure may also be rendered negligible by the impression of an external electromotive force. (2) The number of the hydrogen ions. The greater the concentration, the more rapid will be the corrosive action. Hence, in the presence of acids, corrosion is accelerated and in the present of alkalies, it is retarded. (3) The ease with which the hydrogen ion reaches the iron. For example, an adherent film of iron oxide will protect the metal underneath. Such a film is undoubtedly formed in the case of the copper-steel and accounts for its remarkable resistance. (4) The osmotic pressure of the iron ions. This pressure is usually very small. (5) The deposition of hydrogen and its removal by the depolarizing action of oxygen. This factor is probably the most important of them all. If oxygen be completely removed from boiler feed water, the boilers will not pit nor corrode. By this removal of the cause of the disease not only are all its ill effects avoided but the necessity of drugging with alkali is eliminated.

In conclusion, Professor Walker strongly recommended a closer co-operation between the electrical and mechanical engineers and electrochemists so as to introduce into practice more quickly and effectively the knowledge on the subject of corrosion already at our command.

This paper was discussed by A. S. Cushman, Maxmilian Toch, Frank N. Speller and James Aston. Mr. Cushman referred to the prevalent idea that the presence of a small percentage of copper in iron would enable it to resist corrosion. His own experiments indicated that it was not the copper which was important in this connection, but the presence of gases in the metal. The gas may exist in blowholes, as chemical compounds or in an occluded form. Mr. Toch emphasized the importance of the composition of the soil as affecting corrosion and told of the great difference of different parts of the battleship *Maine* when the hull was raised in 1912. When the Sun Building was torn down in New York City three or four years ago, the steel beams embedded in concrete below ground were found to be free from corrosion.

Mr. Speller discussed the internal corrosion of water pipes, which is found to depend upon temperature, amount of aeration and volume of water flowing. The amount of gas in the water is especially important. Mr. Aston pointed out that physical differences as well as chemical heterogeneity are important in producing localized electrolytic corrosion.

Telephone Progress Told at Dinner of Geographic Society.

The dinner at Washington, D. C., on March 7, of the National Geographic Society in Washington, celebrating the achievements in the art of telephony wrought during the past forty years, was marked by many unique and unusual features. The men who have spent twice as much money in the same length of time for the extension of the telephone service of the United States as the United States Government has spent for the construction of the Panama Canal told the story of the beginning, growth, and glory of the telephone.

During the dinner the Secretary of the Navy conversed with the captain of one of his ships in the Pacific, and received a message urging Washington to stand for preparedness; Gen. Pershing reported from El Paso to Gen. Scott, Acting Secretary of War, that all was well on the border; the Prime Minister and the Postmaster-General of Canada sent greetings to the National Geographic Society, the Postmaster-General of the United States and the American people, expressing the hope that the two countries would go on forever in peace and friendship.

Addresses were made by Franklin K. Lane, Alexander Graham Bell, Josephus Daniels and U. N. Bethell, all of whom paid tribute to the initiative and genius of Theodore N. Vail and J. J. Carty.

Final Summaries on Dallas Utilities.

The final figures in the report of the Dallas utilities situation, as determined by Edward W. Bemis, have been made public. These figures are given in detail below.

The figures show the cost of reproduction of the Dallas Electric Light & Power Company, the Northern Texas Traction Company and the Dallas Consolidated Street Railways Company. The rate-making value of the property is figured as this reproduction cost less accrued depreciation. The figures for the Dallas Electric Light & Power Company are given herewith.

The present points of contention between the utilities and the city are on the items of depreciation and overhead charges, on which there is a wide difference of opinion.

The cost of reproduction, new, of the light plant is given as $3,765,111.24 but taking into consideration the depreciation, this figure is reduced to $2,985,964.42. To this amount $500,000 has been added as the value of the franchise during its present life, making a total of $3,485,964.42 on which it is proposed to allow a return of 8 per cent for the remaining term of the franchise.

Overhead charges claimed by Stone & Webster as necessary in replacing the light plant were found to be $614,413.76. Mr. Bemis reduced this overhead to $490,438.32.

The greatest cut of all in what the company claims to have invested is made in lines east of the river. The total replacement cost claimed was $4,409,366.21, while, eliminating "depreciation" and "overhead" Mr. Bemis claims their values to be $3,434,433.33.

DALLAS ELECTRIC LIGHT & POWER COMPANY.
As of Sept. 30, 1915.

(First column, headed A, shows cost of reproduction new. Second column, headed B, shows cost of reproduction new, less accrued depreciation.)

	A	B
Land	$ 213,312.00	$ 213,213.00
General structure	18,273.72	14,639.57
General equipment	42,164.63	25,973.06
Power plant buildings	212,365.60	184,133.02
Furnaces, boilers and accessories	433,530.15	329,805.44
Steam engines	360,471.23	260,817.15
Electric generators	76,808.00	46,717.22
Accessory electric power equipment	129,744.49	112,930.90
Miscellaneous power plant equipment	111,054.25	89,668.18
Substation building	11,615.71	10,981.06
Substation equipment	117,885.23	93,091.32
Poles and fixtures	290,234.00	217,677.13
Underground conduit	172,418.26	172,418.26
Transmission system	4,695.50	4,286.00
Distribution system	299,739.20	241,754.63
Line transformers and devices	116,722.71	90,212.07
Electric services	113,060.17	87,464.50
Electric meters	229,448.18	139,118.38
Electric meter installation	15,068.00	15,068.00
Street and park lighting	287,796.84	58,119.02
Commercial arc lamps	5,712.44	2,703.92
Electric motors and heaters	4,965.11	4,242.47
Electric laboratory equipment	2,871.02	1,861.82
Other tangible electric property	80,741.04	78,530.98
Total	$3,150,697.48	$2,495,526.10
Promotion expense	60,000.00	
Engineering and superintendence	293,012.50	
Legal expense	55,000.00	
Taxes	14,175.00	
Insurance during construction	6,606.30	
Interest	185,619.96	
Total	$ 614,413.76	$ 490,438.32
Grand total	$3,765,111.24	$2,985,964.42

ANNUAL REPORT OF BELL TELEPHONE SYSTEM.

Big Increase in Earnings and Many Noteworthy Extensions Mark Year.

That the American Telephone & Telegraph Company and Associated Companies were never as a whole in more satisfactory position financially, physically and particularly in their mutual relationship with the public is clearly shown in the annual report of President Theodore N. Vail, just issued.

The Bell System now connects 9,151,221 telephones, a gain of half a million stations in the past year. The total wire mileage owned is 18,500,000, of which 10,500,000 is underground. There are nearly 200,000 miles of phantom circuits which carry an overload from the wire circuits, and 8,652,400,000 telephone connections were made during the year.

The revival of general business is reflected by a growth of 225,300 subscribers' stations in the second half of the year, as against 125,900 during the same period in 1914. The Bell System has been able to respond quickly to the demands made because of its policy of providing plant in advance of requirements.

The net permanent capital obligations of the whole system outstanding in the hands of the public is only $736,156,756, although the telephone plants stood on the books on December 31 at $880,068,520 and their appraisal value is over $61,000,000 in excess of the book value. There was $32,863,717 added to plant and real estate last year and it is estimated that $57,000,000 will be spent in plant additions during the current year.

The gross revenue in 1915 of the Bell System, not including the connecting independent companies, was $239,900,000; an increase of over $13,900,000 over last year. Of this, operation consumed $84,500,000; taxes $13,100,000 or 1.64 per cent on the outstanding capital obligations; current maintenance $31,200,000 and provision for depreciation $44,900,000. The surplus available for fixed charges, etc., was $66,200,000, of which $18,100,000 was paid in interest and $32,900,000 was paid in dividends.

During the past eight years the gross earnings have increased $111,300,000 while the assets have increased nearly $445,000,000, with an increase of capital obligations and payables outstanding of only $273,600,000.

As an evidence of the cheapness of telephone service it is shown that net earnings are only 5.84 per cent of the book value and other assets, and that dividends and interest are only 4.76 per cent on the plant and other assets, using in both cases the book value which is less than the appraisal value.

"The low percentage of earnings on the value of the plant, and the average distribution to capital represented by securities issued against this plant, should convince the most skeptical that under no possible conditions could the public get cheaper service. Whether they could get better service must be left to the decision of those who have had the opportunity of comparing the service of the Bell System with that of other systems either of this country or of the world."

In the three years 1913-1915 inclusive, the expenditures from the Benefit Funds of the Bell Companies have aggregated $3,779,896. The reserves for this fund are $9,114,329 and during 1915 the payments for pensions, sickness, accident and death benefits were $1,397,742.

The net earnings of the American Telephone & Telegraph Company for the year were $41,117,487. The interest charges were $6,498,849, and the dividends at the regular rate of 8 per cent per annum were $29,100,591. Of the resulting balance there was carried to reserves $2,500,000 and to surplus $3,018,046.

The number of stockholders, 65,512, not including the 32,000 "employee" shareholders who are paying for stock out of their wages, shows an increase of 6,097. The majority of the company's shareholders are women. The financing for 1916 was taken care of by the sale of $50,000,000 of 4.5-per-cent coupon notes.

Northern White-Cedar Poles Being Produced Under Great Difficulty.

The present winter has been most unfortunate for the producers of Northern white-cedar poles. In the early part of the season there was every prospect of a good winter's work in the woods and loggers planned to cut on a large scale. All went well until the early part of January, which is just about mid-season in the Northern woods. N. E. Boucher, secretary of the Northern White Cedar Association, in discussing this situation, said:

"The severe weather which started about that time changed conditions very materially. The woodsman likes snow, but the snow this year was very heavy, being three to six feet on the level. This snow was preceded by mild weather and the cedar swamps were not frozen sufficiently to form a good foundation for the necessary roads, so even if a road were broken through the snow, the lack of foundation made it impossible to haul even normal loads.

"This heavy snow made it necessary to stop operations for a while. After this spell of weather cleared up the woodsmen went at it again, but on a smaller scale. After getting nicely started there was more snow and it would seem that the elements had conspired to make it impossible for the woodsmen to accomplish sufficient to make it profitable to continue operations. As late as February 7, the entire Northern country was visited by a 40-hour blizzard, which left another extreme depth of snow.

"The labor situation has been very grave since early in December, men being very scarce and the scale of wages at a very high mark. It is reported that the labor situation in conjunction with the weather conditions made it necessary for many operators to discontinue further cutting early in January, thinking they would do well hauling from the woods the material already cut. Later reports indicate that they will not even accomplish this hauling, and large amounts of material which is buried under the snow will not come out this winter at all.

"To cap the climax, the railroads seem to be, in fact they acknowledge, that they are powerless to furnish even a small percentage of the equipment that is required. It would seem impossible to have a really severe car shortage in view of the enormous rolling stock of the various railroads, nevertheless, it is true and cars are very much at a premium, with no prospect of material relief until well into the summer. One of the largest trunk lines running west of Chicago, on which the Northern producers depend for a large percentage of their equipment, has 24,000 cars tied up in the eastern territory, and frankly states that it cannot offer any encouragement on equipment. They are selecting their freight with a view to best earnings, which, of course, does not include cedar poles, this commodity being considered low-grade freight.

"This combination of circumstances has made it necessary to ship very heavily from stocks carried over from the past year, leaving the supply greatly reduced. It is evident that the production this year has been severely curtailed, and instead of a good-sized production, which was anticipated last fall, the output will be considerably below normal.

"In view of the present high plane of values on all classes of material it is natural to expect advances in price of cedar poles. For those interested in this material it would seem wise to make the necessary arrangements at once."

Southwestern Electrical and Gas Association to Hold Convention May 17-20.

The annual convention of the Southwestern Electrical and Gas Association will be held at the Hotel Galvez, Galveston, Tex., May 17-20, inclusive.

Sessions devoted to interurban and street-railway questions will be held May 17; session on lighting and power questions, May 18, and general sessions on topics common to all utilities, May 19.

As an innovation, each session will be in the hands of a committee selected from those members directly interested in the particular interest, kind or branch of utility business to which such sessions are to be devoted. The province of such committees will be to take entire charge of their sessions, select the topics to be made the subject of the papers, addresses, question-box and discussions, appoint the persons who will make the addresses, write the papers or open the discussions, and operate the sessions for the best interests of those engaged in the business to which the session is devoted. A special committee has been appointed on publicity and public relations to obtain the presence of and addresses from authorities on these subjects.

H. S. Cooper, 405 Slaughter Building, Dallas, Tex., is secretary of the Association.

Convention Program of the Minnesota Electrical Association.

The program for the ninth annual convention of the Minnesota Electrical Association, to be held at the Hotel Radisson, Minneapolis, Minn., March 21 and 22, has been announced.

Tuesday morning, March 21, will be devoted to registration, address by President T. D. Crocker, report by Secretary-Treasurer F. A. Otto, and reports of committees. A luncheon will be given by the Minneapolis Jovian League at the West Hotel. In the afternoon Mayor Wallace G. Nye will give an address of welcome, after which papers will be presented by J. D. A. Cross, on "Possibilities and Practicability of the Electric Range"; O. A. Rofelty, on "Attitude of the Central Station Towards the Consumer"; W. C. Beckjord, on "Rates for Electric Service."

Wednesday morning H. S. Wilton and J. L. Lawrence will present a paper on "Boiler Plant Efficiency," to be followed by the report of the Committee on Rural Extension. In the afternoon Prof. W. T. Ryan, of the University of Minnesota, will present a paper on "Some Central Station and Electric Transmission Statistics." Reports of committees and election of officers will conclude the business meetings.

Engineers to Investigate Methods of Sealing River Basin.

William Mulholland, chief engineer of the Board of Water Commissioners of Los Angeles, Cal., the engineer who supervised the construction of the famous Los Angeles aqueduct, 240 miles in length, arrived in Seattle, Wash., March 13, upon the invitation of City Engineer Dimock, to investigate and make report to Seattle city engineer on the most feasible method of sealing the north bank of the Cedar River, in order that the new masonry dam can be made available for use.

Acting on the advice of City Engineer Dimock, the City Council late last fall engaged the services of R. H. Thompson, former city engineer, and Frederick P. Stearns, of Boston, consulting engineer of the Metropolitan Water Commission of Massachusetts, to make an investigation and report on the best method of sealing the basin

Annual Report of Commissioner of Patents.

The annual report of the Commissioner of Patents covering the activities of the United States Patent Office for the calendar year 1915 has been made public. During the year there were received 67,138 applications for patents on inventions; 2,734 applications for patents on designs, and 197 applications for reissues of patents. There were issued 43,207 patents on inventions, the largest number ever issued in a single year; 1,545 patents on designs, and 182 patents reissued. Patents expiring during the year numbered 20,404. Receipts of the office in 1915 amounted to $2,290,773.47; expenditures, $2,053,442.15; surplus for the year, $237,331.32; total net surplus, December 15, 1915, $7,785,506.48.

Referring in his report to conditions in the Patent Office, Commissioner Thomas Ewing calls attention to the fact that the average time that applications, upon which patents are granted, are in the Office, is 22 months, and that the Office completed the examination of nearly ten per cent more applications than it received during the year. The latter is in pursuance of a definite policy to require prompt prosecution by applicants and their attorneys. He states great sums now wasted on needless litigation and fruitless enterprises would be saved if more money was spent in making it possible to make more thorough searches. Preparations are being made for the occupancy of the entire Patent Office Building later in the year, and relief from congested conditions in the Office will be secured.

Among the recommendations made by Commissioner Ewing are: reorganization of examining corps by reducing the number in the lower grades and increasing the number in the higher grading, so as to make them equal; make the filing fee $20 and final fee $15, instead of $15 and $20, respectively; eliminate payments to office by treasury certificate of deposit; refundments to be made directly by the Office; establishment of an assignees' index; requiring the filing with the office of every patent litigation decree; validate patents when applications are executed by attorneys for clients, under certain circumstances, notably those brought about by European war.

Washington State Bureau Files First Report on Seattle Municipal Plant.

The State Bureau of Accountancy has filed its first report relative to the operation of the municipal light and power plant in Seattle, Wash., during the year 1915. According to the report, the gross earnings of the plant during 1915 were $1,067,180.02; net earnings, $199,088.41; commercial lighting revenues, $577,521.95; commercial power, $121,469.75; street lighting, $199,994.95; city buildings and grounds, $26,303.10; city power, $34,048.92; other public buildings, $3,949.35; miscellaneous revenues, $441; miscellaneous rentals, $3,450.

Expenses of the department include $56,160.16 for water power generation; $112,466.26 for steam power generation; $2,079.18 for current purchased; $40,951.99 for transmission and transformation; $323.26 for storage; $160,656.28 for distribution; $85,690.55 for commercial expenses; $101,052.00 for general expenses; $178,627.72 for depreciation; $112,016.61 for interest, bad debts and other items; $9,281.25 for appropriations, and $8,785.96 for profit and loss adjustments, leaving a net balance for the year of $199,088.41.

During 1915, $400,000 of steam plant bonds were sold, bringing the outstanding bonded indebtedness of the light system to $3,923,000. During the year, $71,000 of bonds were retired. The light and power system is given a valuation by State Accountants of $6,786,357.80, including the new masonry dam, which is given an investment value to date of $1,508,821.26.

Miscellaneous NEWS NOTES

St. Louis Engineers Hear Lecture on Fortifications.—Major Wildurr Willing, of the Engineer Corps, United States Army, spoke before the Engineers' Club of St. Louis March 15 on "Seacoast Fortifications." The lecture showed the development and general principles underlying the use of seacoast fortifications in the United States, and was illustrated with a large number of slides.

Power Company to Refrain from Using Poles of Street-car Company.—In an opinion given to the Board of Supervisors, City Attorney Long states that the San Francisco & Sierra Power Company has no legal right to furnish electric power to customers by using the United Railroads' poles for carrying the wires. He says the franchise for the erection and maintenance of the poles is granted only for the operation of a street-railway system and there is no authorization to utilize them for any other purpose.

Plans for New England Section Convention.—The eighth annual convention of the New England Section, National Electric Light Association, will be held at Hotel Aspinwall, Lenox, Mass., October 17-20, 1916, sessions continuing from Wednesday to Friday, inclusive, with the usual social event the evening of Tuesday, October 17. The nearness of Lenox to Boston, and to the large centers in western Massachusetts and Connecticut, insures the attendance of a very large number of delegates, while the well known charm of the Berkshire country in early autumn will prove a potent attraction to automobilists and others.

Puget Sound Telephone Merger.—The merging of the lines of the Puget Sound Independent Telephone Company, headquarters in Everett, Wash., and the lines of the Pacific Telephone & Telegraph Company, in operation in Snohomish, Skagit and Island Counties, between Seattle and Bellingham, is being consummated. The Puget Sound Telephone Company, recently incorporated and capitalized at $200,000, will handle the business of the merged lines, maintaining headquarters in Everett. The deal involves several thousand telephones, and will have the effect of giving the territory a single, instead of a dual, telephone service. The Puget Sound Telephone Company already has taken over the Independent Telephone headquarters in Everett, but the actual physical consolidation will not take place until about May 1, when an appraisal now under way of the value of the lines of the Pacific Telephone & Telegraph Company in this territory will be finished. Officers of the new company are: W. N. Winter, Everett, president and general manager; W. C. Cox, Everett, vice-president, and J. M. Winslow, Seattle, secretary-treasurer.

Chicago Automatic Telephone System to Be Sold.—By a vote of 46 to 22 the City Council of Chicago, on March 11, approved the sale of the automatic telephone system of the Illinois Telephone & Telegraph Company to the Chicago Telephone Company. The price set is $6,300,000, of which the city will receive $500,000. The capitalization of the Chicago Telephone Company will be increased only $1,532,058; the difference between this and the total purchase price will be taken care of by the American Telephone & Telegraph Company. The automatic system installed by the Illinois Telephone & Telegraph Company was under a franchise which specified that unless the company maintained service to 20,000 customers all its rights and property were to be confiscated by the city. It was found impossible to keep as many as 20,000 subscribers on the automatic system, although the service rendered was very good. Therefore, the city undertook to confiscate the plant, but after prolonged consideration decided to relinquish its claim upon the property for $500,000 and permit its sale to the Bell System. This ends telephone competition in Chicago.

Address on "Journalism" Before Los Angeles Jovians.—The principal speaker at a meeting of the Los Angeles Jovian Electrical League March 8 was Charles E. Jarvis, Los Angeles representative of the *Christian Science Monitor*, who made a plea for clean, wholesome journalism in his address on the subject "Journalism; Its Opportunity and Achievement."

Kansas City Rejuvenation on Board Boat.—The third rejuvenation under the administration of A. P. Denton, First Tribune, and J. D. Todd, Second Tribune, of the Kansas City Jovians, will be held in May on the steamboat *Chester*, during a trip on the Missouri River. The ladies will accompany the Jovians, the ceremonies taking place in the large dining room.

To Appraise Merchants Power Company's Plant at Memphis, Tenn.—William A. Baehr, of Chicago, Ill., has been appointed by the Merchants Power Company, and F. W. Ballard, of Cleveland, by the Commissioners of Memphis, Tenn., to make an appraisal of the company's holdings. The agreement is that the two engineers are to choose a third arbitrator and if unable to agree on the choice or a price at which the city may purchase the plant, the city will build a plant under Mr. Ballard's direction.

Ruling Asked on Competition of Public Utility Companies.—Whether a municipally owned and operated lighting system may enter the confines of another municipality and compete with a privately owned and operated lighting system is one of the important questions now before the State Railroad Commission of California. This question has been raised by the recent application of the Pacific Light & Power Corporation, asking for protection in South Pasadena against possible competition on the part of the city of Pasadena unless the city obtains a certificate of public necessity and convenience.

Kentucky to Have Workmen's Compensation Law.—Electrical utility companies and contractors in Kentucky will shortly be working under a workmen's compensation law similar in its terms to the laws which have been enacted and are in operation in other states. The State Legislature has passed the law substantially as it was drafted by a commission composed of representatives of various commercial organizations. Although it does not create a state insurance fund, it provides for insurance with commercial companies in the state or with mutual companies and it is virtually compulsory since it withdraws certain of the common-law defenses from the employers who do not come in under its provisions.

Pennsylvania Electric Association Establishes Geographic Sections.—At the last meeting of the executive committee of the Pennsylvania Electric Association, an affiliate of the N. E. L. A., held in Harrisburg, Pa., a plan of establishing geographic sections and inaugurating local activities was adopted. The following six sections have been created and the men mentioned have been duly appointed to respectively initiate the work in these sections: Northwest section, E. F. McCabe, Titusville, chairman; southwest section, H. N. Müller, Pittsburgh, chairman; north central section, G. E. Wendle, Williamsport, chairman; south central section, C. M. Kaltwasser, Harrisburg, chairman; northeast section, E. S. Osborne, Scranton, chairman; southeast section, H. H. Ganser, Norristown, chairman; E. D. Dreyfus, Pittsburgh, Pa., chairman-at-large. The plans have been carefully worked out for instituting close co-operation and a helpful relationship between neighboring utilities throughout the state which results will be accomplished through active subsidiary section organizations. Meetings will be held in the cities mentioned above every two months.

Wiring Cost Limited to $2.00 Per Outlet.—The City of Cleveland, Tenn., has passed an ordinance requiring electricians to pass an examination and take out licenses and limiting wire charges to $2 per outlet.

Must Build Lines Within One Year.—The Railroad Commission of Iowa has issued an order requiring all companies securing franchises for erection of transmission lines to build the lines within one year or forfeit the grant.

New York Jovian League Elects Officers.—At a meeting of the Jovian League of New York City on March 15, officers were elected as follows: Arthur Williams, president; James R. Strong, secretary; and A. S. Devena, treasurer. Board of Governors: E. W. Rockfallow, James R. Pollock, T. Beran and W. H. Rugg.

Wichita Jovians to Entertain Contractors.—J. L. Harvey, first tribune of the Wichita Jovians, has announced that the Wichita Jovians are planning to entertain the Electrical Contractors' Association of Kansas at the state convention May 19. There will be a motor trip over the city in the morning, luncheon with the Electric Club at noon, dinner in the evening, followed by a rejuvenation.

Tampa Company Changes to Oil Fuel.—The Tampa (Fla.) Electric Company is planning to change from coal to oil as fuel in its generating station. The company is preparing to erect large tanks in order to get a big supply on hand. As the central station is located near a residential section of the city the company desires to eliminate trouble due to smoke and cinders.

May Have Certified Copies of Meter Reading.—The city Council, or Argenta, Ark., is considering an ordinance recently presented, requiring the meter records of the public utility companies to leave certified copies of their readings with consumers when the reading is made. An objection has been made to the ordinance, on the ground that it would involve additional expense, in the way of loss of time, without any benefit to the consumer.

Utility Stockholders Must Pay Same Rates as Other Subscribers.—The Public Utilities Commission of Kansas, after investigating at Olpe, rendered a decision that the stockholders of a utility must pay the same rates as other subscribers. The case was that of the Center Township Telephone Company, which had asked to be allowed to increase rates. The commission found that stockholders were paying less than others, and figured that if rates were the same to all they would be sufficient, dismissing the application.

Utility Company Prepares Booklet.—The Northern States Power Company, with main offices at Minneapolis, Minn., owns and operates ten hydroelectric plants with a capacity of 41,000 horsepower, 13 steam-electric plants with a capacity of 74,000 horsepower, and supplies electric light and power to more than 100 municipalities in Minnesota, North and South Dakota, Wisconsin and Illinois, besides gas, heating, telephone and street railway service in a number of communities. The number of customers at the close of 1915 was 81,322. The company represents the constructive work of H. M. Byllesby & Company. These facts and others relating to public service are set forth in a profusely illustrated booklet recently issued by the company. A brief outline of its plan of partnership with citizens is also presented.

Electric Piano Makers to Hold "Week."—It is announced by The National Electric Piano Makers that it has been decided to postpone until the coming autumn the "Electric Piano Week" campaign originally proposed to be instituted during the week of March 13 to March 18. The many central-station companies which had agreed to incorporate in their contracted display advertising for that period a "box" featuring the electrically-driven player-piano and the electrically-operated talking-machine have been notified accordingly. The piano manufacturers urged the delay in order to have more time to educate their retail trade to the degree of co-operation with local electric light and power companies that will be required upon their part. The active aid of the National Electric Light Association in the working out of the "celebration" is assured the electric piano makers.

Maine Hydroelectric Company to Add Two 6,500-Kilowatt Units.—Plans for the extension and additions to the plant of the Rumford Falls Power Company, Rumford, Me., includes the installation of two new vertical water turbines of 6,500 kilowatts rating each. These, together with the two 4,000-kilowatt units now installed, will give the station a normal capacity of 21,000 kilowatts. The construction of a new concrete dam with canal will be begun early in the season, after the time of high water has passed, and the station building will be extended.

Fire Prevention Commissioner to Follow Up Wire Men.—The Fire Prevention Commissioner for the Metropolitan District of Boston has sent out a form letter to all contractors and electricians connected with the industrial establishments in the district, saying that wiremen should be held responsible for careless methods of working, as well as for defective wiring. An example of the former is a recent instance in which a fire was caused by the workman carrying a lighted candle into a portion of the building where loose rubbish was lying about. The Commissioner will investigate and ascertain the names of the journeyman and his employee, in cases where fires are reported as having been caused by electric wiring, and report them to the State Examiner of Electricians for action on the licenses. Recurring fires would raise the presumption of unfitness of any firm to carry on the business, according to the Commissioner.

Turbine Development Described Before Lynn Section A. I. E. E.—On March 1, Richard H. Rice, chief engineer of the turbine department of the General Electric Company, at Lynn, Mass., delivered a lecture on "Lines of Progress in Turbine Engineering." This is the first of three special lectures arranged by the executive committee. The lecture was illustrated by a large number of lantern slides, and the speaker said that great as had been the advance in development, which has brought the turbine to almost apparent perfection, he had no doubt but numerous changes looking toward efficiency would continue to be made. Of exceptional interest was the description of the mercury steam turbine. In this type the steam is heated with mercury vapor, with resulting high temperature and great efficiency. The new type of condenser was also described and illustrated by models brought to the hall for the purpose.

Activities of St. Louis Jovian League.—The St. Louis Jovian League of Electrical Interests will co-operate with the Society for Electrical Development in its National house-wiring campaign, to be conducted from March 15 to April 15. Frank D. Beardslee, president of the St. Louis Jovian League appointed a committee composed of T. H. Stephenson, William Koenneman, Ed L. Gross, H. W. Korhanuer and H. W. Beck, to confer with a committee from the Society. The St. Louis Jovian League will join forces with the National Household Show and give a combination show April 3 to 15. The Jovian League has taken one-third of the space, which will be devoted to the display of electrical household conveniences and appliances. William McChesney Martin, chairman of the Federal Reserve Bank Committee, was the speaker of the day, at the weekly meeting on March 8. In introducing Mr. Martin, Chairman Cliff R. Croninger, said that Mr. Martin represented financial preparedness. "The Federal Reserve Bank," said Mr. Martin, "will not prevent hard times, but it will prevent a panic when the hard times come. If your business deserves credit, you may secure it through your bank."

Electricity in Leather Manufacturing

A Discussion of the Processes Involved in Tanning Hides; With Data on the Specific Advantages of Electric-Motor Drive and a Description of Two Typical Installations

Industrial Power Series—Article No. 158.

Manufacture of leather is conducted in three distinct ways: tanning by the acid of bodies containing tannin; tawing with alum and common salt; tawing with oil. The whole skin is not converted into leather, but only that portion which possesses a fibrous texture. The skins of almost all quadrupeds may be converted into leather. In practice, the hides of bulls and oxen yield the best leather for soles, harness and for belting, while calves' skins furnish the best upper leather for boots and shoes. Lamb, sheep, goat, and buck skins are generally tawed with alum or oil for the preparation of glove or bookbinders' leather. There is a wide difference in the processes employed, as the uses for hides vary from sole leather to light kid. When first considered there seems to be very little in common in the skins of animals, but the structure is similar although the practical application varies to a considerable extent.

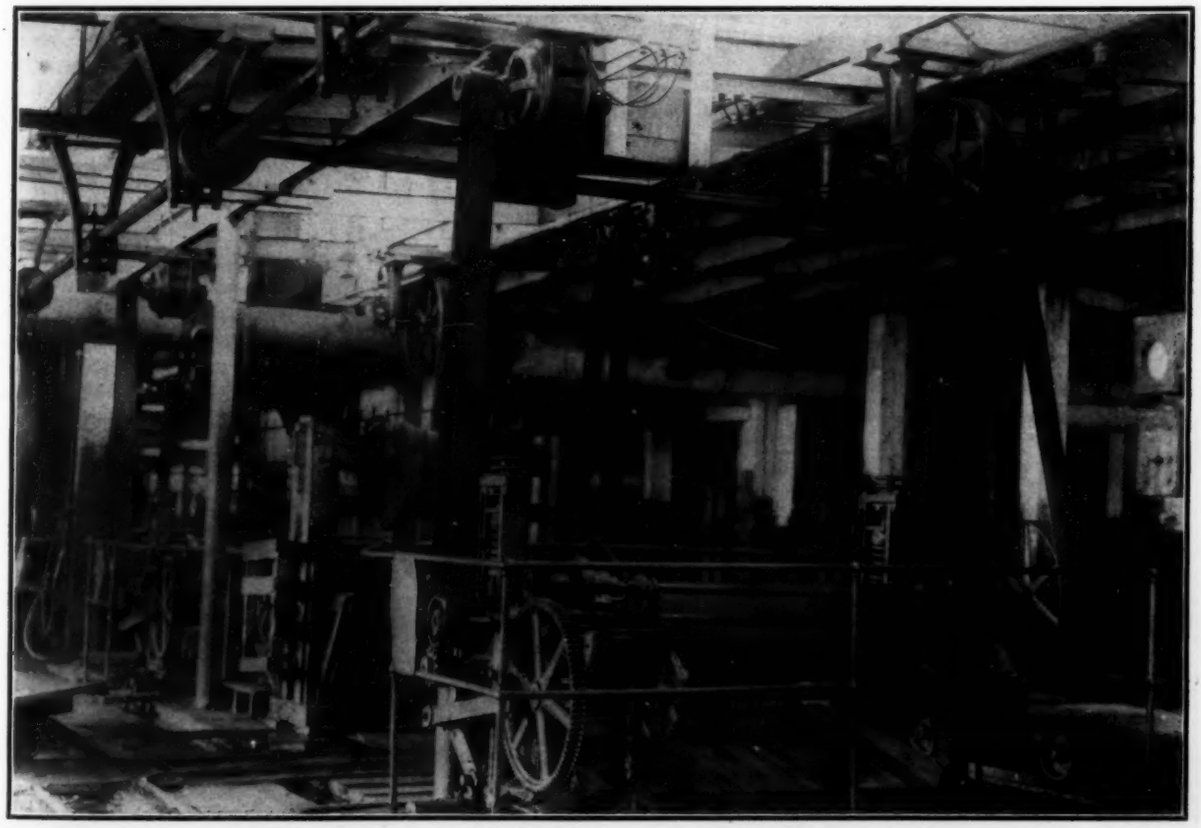
Process of Manufacture.

Green skins, salted skins, and dried skins must be soaked in water to remove the blood and dirt from the first, salt from the second, and also for the purpose of softening the skins. Before entering the unhairing solutions the skins must be free from all foreign matter. Skins are removed from the soaks after they have become soft and pliable and are in a clean condition, after which the ears, tail and adhering flesh are cut off. From a few days to a few weeks, depending upon the condition of the hide, is the time required for soaking. Wash mills are frequently employed for a short time for hides that soften very slowly, to expedite the work.

Fleshing is the next process, after soaking, which removes the accumulation of fat or flesh that may have adhered to the skin. Fleshing machines consist essentially of a spiral-bladed cylinder, right and left hand from the center, by means of which the flesh is removed and the hide stretched in all directions. Loosening the hair is accomplished by sweating, liming, or treating with depilatories.

Liming consists of placing the hides in vats with milk of lime, frequently transferring them from one vat to another, or taking them out or replacing them, to allow the lime to act equally on every part. When the hair is found to be properly loosened the hides are withdrawn. Depilatories are used for skins of smaller animals, which will sustain neither sweating nor liming. Removal of the hair takes place in the unhairing machine which consists of a spiral blunt knife revolving on a rubber roller. The skins are then washed in water.

Bating is next resorted to for the purpose of removing the lime and the lime soaps which have been formed in the skin. Swelling or rinsing the hides is next resorted to in order to swell the fibers, and to make the skins more susceptible to the tanning solutions. Currying is the process



Hide Wringer in Leather Factory Driven by a 10-Horsepower Motor.

Motor-Driven Fleshing and Unhairing Machines.

Battery of Drums Driven by 75-Horsepower Motor.

by which the tanned skins, after being converted into leather are prepared for use. For sole leather it consists in merely hammering the dried hide to render it more compact. For finer leathers the skins are shaved, the object of this operation being to bring the leather to a uniform thickness. The machine which is used for this purpose is fitted with a spiral knife blade of steel, half of which is right-handed and half left-handed. The leather is placed over a roller, which may be pressed against the cutting edge by pressing on a foot lever. The knives revolve at a very high rate of speed and are constantly sharpened by means of an emery wheel. Splitting has replaced shaving to quite an extent, especially for side leather, which is now almost uniformly split out of the limes. In this process the leather is sliced parallel to the grain surface, so that the split portions have the same area as the original leather. Among the numerous types of splitting machines, the one most used consists of an endless double-beveled knife which passes around two pulley wheels, one of which is motor-driven. The leather is pushed toward the knife, grain upward, by two feed rollers, the grain split passing over the knife and the flesh split under it. The thickness of the split can be varied from one-sixteenth of an inch up to the thickness of the hide.

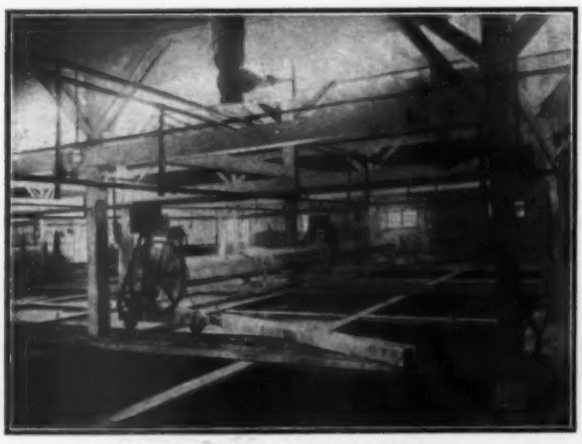
The leather is then grained with the pommel or grain board, finished off with a flattening iron or horn to remove the grease, etc.

The skins must be softened before they can be finished and this process is carried out on the staking machine. This machine works the leather up by a sort of kneading motion and at the same time exerts upon it more or less stretching action. After staking the goods are spread on a table and given a coat of a mixture of flaxseed mucilage and milk, hung up again to dry and again staked. The skins or hides are then rolled in a rolling jack in which a steel roller passes over a bed in such a manner that a great pressure is secured, the object being to work out the wrinkles and give a better appearance to the finished product.

Electricity in the Manufacture of Leather.

The output of 951 establishments reported in the last census as engaged in the manufacture of leather shows an increase in 1909 of approximately 10 per cent over that of 1914, the total production for 1909 being more than 142,700,000 hides and skins. Many of these tanneries are completely electrified, and a still larger number have installed partial equipments to meet the requirements for additional capacity. In general the application of electric motors to the driving of tannery machinery offers the same advantage as in other industries with the distinctly important features of decreased power consumption and increased production for a given equipment. Owing to the extended areas over which power must be transmitted, the losses incurred in steam-driven plants due to shaft and belt friction constitute from 35 to 70 per cent of the total energy consumed. In addition to this loss several engines and isolated boiler equipments are usually necessary with high cost for attendance and maintenance. The major portion of this power cost may be eliminated by the application of the motive power direct to the various machines. The cost of energy in a plant operated in this manner becomes very nearly proportional to the work done.

Existing installations of electric motors for tanning machinery have already proved that a given equipment will do more work when electrically driven, due mainly to the greater uniformity of speed attained and to improved control. Other advantages which indirectly affect the cost and the quality of the production are: Greater cleanliness, materially reducing the percentage of damaged leather in the



Motor-Operated Lime Reel in Tannery.

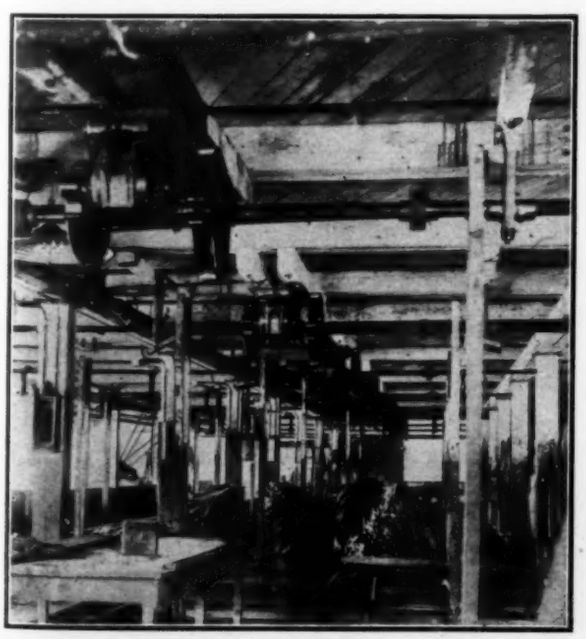
Eight-Foot Oil Drum Driven by 10-Horsepower Motor.

final process of finishing; most convenient and logical arrangement of machines, insuring the handling of the hides from one machine to another quickly and economically; and reliability of operation, since failure of any driving motor can affect only a small part of the plant machinery. This factor is of vital importance in tanneries since the failure of power at certain stages of the process will frequently entail a heavy loss.

Group drive is used in a large part of the existing motor installations in tanneries. Many of the machines used for preparing leather are best adapted to group drive on account of the intermittent power requirements. This feature is especially true of heavy staking, rolling, and glazing machines having reciprocating motion with the load applied only during a portion of the stroke. On the other hand, machines requiring power for longer periods or high-speed apparatus can well be driven by individual motors. The clumsy and expensive belt-shifting device can be replaced by the electric switch conveniently arranged for control by the operator. Additional machines may be installed without interfering with the operation of those already installed and with no additional outlay except for motors and installation. Overtime work can also be economically provided for, either in large or small quantity, the power requirements being directly proportional to the work done.

On account of the presence of a large quantity of steam, acids or strong alkalis, the motors must be exceptionally insulated to insure uninterrupted service. The squirrel-cage type of induction motor combines features of simplicity and durability which enable it to withstand the most adverse conditions, as may be seen from some of the illustrations. Aside from the inherent superiority of the induction motor over the direct-current type for rough service, the alternating-current system offers further advantage because of the possibility of efficient transmission of power over large areas. Not only can this energy be transmitted at small loss, but the cost of the initial installation is lessened owing to the amount of copper required for transmission wires.

A large number of pumps is necessary in tanning establishments for transferring water and tanning liquids. The pumps when electrically operated may be direct-connected to the motor, and started and stopped by throwing the controlling switch. It is also possible to place the pump in the most convenient location regardless of the source of power. Several fans are usually employed to expedite the drying of the hides or skins between the various operations of tanning, washing and dyeing and these are most satisfactorily driven by direct-connected motors. Many of these fans are required to operate 24 hours a day under conditions which require frequent attention and repairs when driven by mechanical means.



Back-Geared Motors Driving Rockers for Tanning Vats.

Battery of Drums Driven by 15-Horsepower Motor.

Data on Typical Installations.

The electrical equipment of Endicott, Johnson & Company's tanneries at Endicott, N. Y., includes about 120 motors with a combined rating of nearly 1,400 horsepower. Both the group and the individual systems of drive are used, but the latter seems to be the most in favor. The method of driving the fleshing and unhairing machines is a good example of the application of separate motors to each machine. There is a fleshing machine driven by a 10-horsepower motor suspended from the ceiling and two unhairing machines driven by 7.5-horsepower motors which are supported on suitable brackets. The lime mixers throughout the plant are provided with standard three-horsepower motors with back gear for speed reduction. This back-geared type of motor is also used effectively for operating portable lime reels. The use of this device allows a much more compact arrangement than could be obtained by belting or by using one large gear for speed reduction. It is a simple matter, therefore, to totally inclose the motor, thus protecting it from the liquids in the vats over which the reels are required to operate. The paddle wheels for washing the hides in various solutions are mainly operated in pairs by 5 or 7.5-horsepower motors.

Owing to the uniformity of operating speed, the squirrel-cage induction motor is especially suitable for driving leather splitters, producing leather of a much more uniform thickness than is possible with the varying speed conditions which are unavoidable with mechanical drive. These machines are driven by 7.5-horsepower motors suspended from the ceiling. The tanning and washing drums are mainly driven in groups, requiring somewhat less power in motors than would be necessary with individual drive. The shaving and shanking machines are driven in groups by motors rated from 7.5 to 15 horsepower. In one instance five shanking machines are individually driven by five-horsepower motors, each motor being controlled by the operator by means of a specially constructed switch. Following the usual practice, group drive is employed for glazing jacks, seven machines being operated from a 10-

horsepower motor. Staking machines are driven in the same manner, a 15-horsepower motor in one case driving six machines. Motors of 15 horsepower are also arranged for driving groups of four rolling machines each, for finishing the sole leather.

The Ohio Leather Company, of Girard, O., operates one of the largest tanneries in the Middle West. Its plant is equipped throughout with modern electrically driven machinery. Previous to 1907 the plant was operated by several steam engines, but at this time, on account of the heavy expense involved in maintaining this equipment and also the requirements for additional capacity, it was decided to electrify the entire plant. In applying motors to various types of machinery the individual system of drive was used wherever possible. The installation now comprises 218 induction motors of the squirrel-cage type totaling 872 horsepower. These are operated at 220 volts and 60 cycles. Individual drive is employed for operating belt-knife splitters, fleshing and unhairing machines, color drums, setting out machines and many others. Group drive is employed for operating the glazing jacks, staking machines, and also the shaving and shanking machines. By the installation of electric drive in this tannery the company has been able to eliminate a large percentage of the line shafting and belting and thus reduce the friction loss to a minimum. In making additions to the present equipment it has been found to be a very simple matter to install new apparatus, equipping each machine with its own driving motor. The accompanying table gives the horsepower requirements of a few of the more important machines used in the leather industry.

HORSEPOWER REQUIREMENTS.

Application.	Horsepower.
Fleshing Machines	30
Wash Mill	10
Shaving or Skinning Machine	10
Dry Mill	5
Reels	2-5
Staking Machines	5
Splitting Machines	10

Electricity as a Friend of Animals.

While medical annals have been recording the marvelous work of the X-ray in saving human life and volumes have been written of the work of the great experimenters, an unheralded and modest hero of the X-ray has been carrying this saving light of science into another field, that of our four-footed neighbors. Dr. Louis Griessman's Yorkville Veterinary Hospital and X-Ray Laboratory, in New York City, for the treatment of horses, dogs, cats, birds and all kinds of pets, is the only one, so far as is known, in the world. Certain experimental work along this line has been done in the University of Colorado but Dr. Griessman is the only man to organize an institution for carrying on practical work. He will shortly round out a year of successful work in his chosen field. During this time he has diagnosed under the X-ray hundreds of cases of bone diseases, fractures, dislocations, heart enlargements and tubercular conditions of various tissues and organs. His subjects have been horses, dogs, cows, cats, chickens, canaries and monkeys. His laboratories are equipped for handling all kinds of animals from the largest to the smallest. For horses and cows he has constructed a tilting table operated by an electric motor. The horse stands beside the table while it is in a vertical position. He is put in a sling and shackled and when all is ready the table descends to a horizontal position. Dr. Griessman has invented a scheme for suspending the X-ray tube by means of pulleys and wires so that it can be conveniently swung to any point. Innumerable difficulties were encountered in handling the service in Dr. Griessman's hospital which were solved by Frank V. McGirr, a young engineer of the New York Edison Company. Dr. Griessman has done some remarkable work in detecting the presence of tuberculosis in cattle.

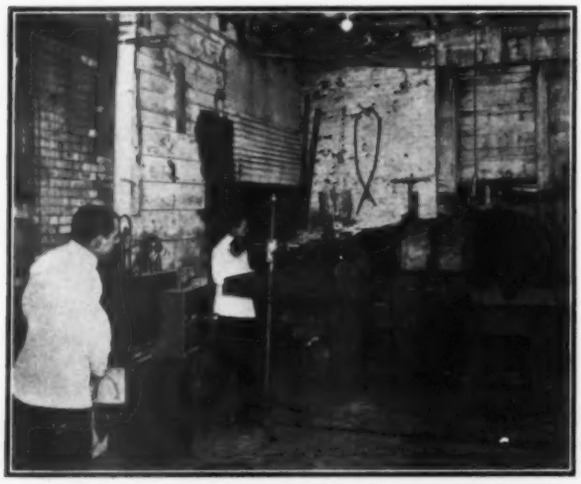
Water Power in Washington Enormous.

The United States Geological Survey and the Washington Board of Geological Survey are co-operating in investigating the water supply of the State and the related physical features that affect the development of power and irrigation.

Yakima River is probably the most valuable stream in the State. It can supply water for irrigating about 650,000 acres of land, besides furnishing 132,000 horsepower continuously and an additional 155,000 horsepower for pumping water during the irrigation season. The fact that only 300,000 acres of land are now irrigated, and that only 14,000 horsepower is available from present power plants indicates great opportunities for agricultural and industrial expansion. All the power estimates in the report have been based on the assumption that the water is more useful for irrigation than it is for power.

A summary of power available on Naches River and its tributaries shows that 97,900 horsepower can be used continuously, and that an additional 62,000 horsepower can be used during the irrigation season for pumping water to lands which can not be served by gravity systems. Most of the power sites on Naches River will require relatively short transmission lines for the delivery of energy.

A copy of Water-Supply Paper 369 may be obtained free of charge by applying to the Director, United States Geological Survey, Washington, D. C.



Taking Radiograph of Neck Growth on a Horse in New York Hospital.

Horse is Secured to Table and Latter is Then Tipped by Motor.

Commercial Practice in New England

House-Wiring, Concentric Wiring and Building Up Power Load Discussed at Boston Convention of New England Section of the N. E. L. A.

The second Question-Box Convention, under the auspices of the New England Section, N. E. L. A., was held at Boston, Mass., March 7 and 8, with about 200 members in attendance. This convention takes the place of the spring convention, held in former years, and proved, as it did last year, to be a valuable medium for the interchange of ideas among the members.

The sessions were held at the American House, and opened Tuesday morning. R. W. Rollins, of the Worcester Electric Light Company and Section vice-president, called the meeting to order, and introduced C. R. Hayes, manager of the Fitchburg Gas & Electric Company, as chairman of the Question Box Committee. Mr. Hayes outlined the scope of the convention and introduced E. R. Davenport, Providence, R. I., as chairman of the session.

The general topics considered the first day were Station Operating Prices and Distribution, and on the second day Commercial Practice and Accounting. Questions which had previously been sent to the Secretary were read by the presiding officer and discussed informally by members. Particularly interesting sub-topics concerned house-wiring campaigns, the introduction of concentric wiring, electric ranges and the building up of the power load. F. A. Gallagher, of the Narragansett Electric Lighting Company, Providence, R. I., described the results of a two months' house-wiring campaign, which has yielded 391 new contracts, aggregating $41,625, or an average of $106.46 each. The total connected load added is 458 kilowatts. The campaign was conducted at a profit of about $5,000, and the estimated income is $2 per customer per month. Another campaign is soon to be begun by the company.

The Cumberland County Power & Light Company, Portland, Maine, has found it to advantage to enlist the local contractors rather than do wiring itself. The fourteen contractors in the local association, with their salesmen, are equivalent to so many solicitors for the central station, and the company is not under the necessity of carrying a stock of wiring materials.

A. F. Townsend, Woonsocket, R. I., believed in the policy of encouraging the contractors to handle appliances. The Blackstone Valley Gas & Electric Company, of which he is manager, allows contractors to draw on the company supply and enjoy the 10 per cent margin. The company retails its appliances at list price.

The Danbury Gas & Electric Company, Danbury, Conn., reported that it co-operates with the contractors, as far as the outlet, the company carrying fixtures, on which it makes sufficient profit to carry the soliciting expense on wiring contracts.

House-wiring of mill tenements on a rental basis was described by H. M. Parsons, general manager, Central Massachusetts Electric Company, Palmer, Mass., where a large number of "corporation tenements" have been wired with an average of five outlets, at about $30 per tenement. The installation consists of a three-light shower, one two-light fixture, two side brackets in chambers, and a drop light in kitchen and cellar. The tenant pays the lighting company at the rate of 15 per cent per year for the use of the fixtures, energy being supplied at the regular net lighting rate of 15 cents. After the installation has been in several months, the house owner is usually induced to purchase it at cost, charging the tenant the 40 or 50 cents a month extra which the 15 per cent represented. The company has several thousand dollars which it is constantly turning over in making similar house installations.

In Leavenworth, Kan., it was reported, house wiring with about three outlets per installation has been done free of charge, the cost to the central station being $6 to $8 per outlet.

M. R. Griffith, of the General Electric Company's Boston office, reported the following results of the Boston house-wiring campaigns:

1914, 1,186 houses. Income.....$29,096
1915, 1,524 houses. Income..... 35,270

Average, 127 houses a month; 5 hours a day. Payments required as follows:

Monthly payments of $2 to $2.99, 12 months to pay.
Monthly payments of $3 to $3.99, 15 months to pay.
Monthly payments of $4 to $4.99, 18 months to pay.
Monthly payments of $5 and over, 20 months to pay.

The Boston Edison Company's store-wiring campaigns resulted in securing in 1914, 1,307 stores using gas, and in 1915, 1,102 stores. These represented 38,733 equivalents and an income of $133,420. The cost of wiring was $63,745; average income $5.99 per customer. Five outlets were wired for $17.50, four for $15.50 and three for $13.50; over five outlets $2.50 additional.

In Hartford, Conn., a list of all unwired houses and tenements is kept. Last year 545 houses, with 1,300 tenements, were connected. Cleveland, Ohio, wired 3,000 houses in 1915, it being the practice to give a credit of 15 per cent of the cost on the customer's lighting bill. Minneapolis, Minn., has connected 1,990 houses, with 7,000 new customers.

C. R. Hayes, Fitchburg, Mass., raised the question as to gas competition. E. P. Rowell, Plymouth Electric Light Company, reported that both gas and electricity had, in 1915, shown the greatest growth locally in the history of both plants. The electric company added 500 customers—rather more than the gas company, which secured mostly heating and cooking business. C. E. Greenwood, of the Boston Edison Company, reported results in New York City as showing a vastly greater increase in electric lighting. Mr. Hayes said the adoption of British-thermal-unit tests for gas is due to the large consumption in heating and in cooking. Mr. Townsend said that his company is selling less gas and more electricity each year for lighting, and the increased consumption of gas is mainly for domestic uses. Mr. Gallagher reported that in the recent wiring campaign at Providence 280 gas customers had been secured and electric lighting substituted.

To the question whether the gas arc seriously competes with high efficiency incandescent lighting, Henry Schroeder, of the General Electric Company's lamp sales office, pointed out that the Mazda C easily surpasses the larger sizes of the gas arc, and the C E Z burner is about the equivalent of a 40-watt unit. Fifty-watt incandescent units easily compete with the Humphrey 7, 60-watt with No. 20, 200-watt with No. 30, and 300 with No. 50, electricity being considered at 8 to 9 cents, and gas at $1.

The Portland company reported that formerly the gas arc was a competitor for store business. The company rents fixtures with large C units with good effect as an entering wedge. This year it is installing the Equalite lamp at $1 down and $1 per month, giving free maintenance for one year. The C lamp has actually increased the lighting load. One man is kept on the work of introducing the high-efficiency lamp in place of smaller tungsten or carbon units,

or gas. The Plymouth company reported that the C lamp had increased factory and store lighting business, and the Portsmouth (N. H.) company has secured revenue not otherwise obtainable. The Central Maine Power Company, Augusta, Maine, called attention to the use of the Mazda C lamp in stores where lighting is obstructed, as, for example, in hardware stores.

The use of illuminated flag signs was taken up. It is considered legal to use the American flag in this way, if disassociated from advertising legends. One company is renting a four-foot flag at $10 per week, the user paying cost of connection. Another central station operates two seven-foot flags, each equipped with 7.5-watt lamps. The total cost of a medium sized flag is $66.00, and of the flasher $35. Cost of installation is extra.

Securing New Business.

Proper outlay for commercial development is 2 to 2.5 per cent of gross revenue, which should give $4 added revenue for each dollar expended. Sixteen customers added to one company's business last year added 12.2 per cent to the load and 14.3 to the gross revenue. This represented an outlay of only two-thirds of one per cent, and a return of $20 for each dollar expended in securing the business.

J. E. Spike, Cambridge Electric Light Company, said his company installs motors of 20 horsepower and under, on one week's free trial; often this is the wedge by which a whole factory installation is placed. F. H. Smith, assistant manager, Worcester Electric Light Company, believed it to be more feasible to go after the motorization of an entire plant.

F. C. Hard, Boston Edison Company, described the introduction of irrigation by electric pumping on a 10-acre farm eight miles from Boston. A three-horsepower, single-phase motor operated a pump which discharged through a system of iron pipes perforated at an angle from the horizontal. The cost of watering the whole area was about $36 a year on the company's miscellaneous rates of three cents. During the season when the apparatus is not in use the customer pays a minimum of 75 cents a month.

Eugene Carpenter, Newton, Mass., pointed out the opportunities for irrigation in New England, and particularly on Cape Cod. One acre watered will yield three times the amount of produce that an acre will produce without irrigation, even in the East. Strawberry crops are greatly increased by watering the berries when setting. The hours best suited to irrigation being from 11 p. m. to dawn, the electrically driven pump will produce a good return to the central station, at fairly low rates.

Electric Cooking.

The remarkable progress being made in introducing the electric range was illustrated by the Boston Edison Company's sale of more than 400, at a profit, within a few weeks. Charges on the equipment used in connection with these units is taken care of, in part, at least, by the 10-cent primary rate. The secondary rate is 2 cents.

Water heating by electricity was regarded as a good proposition by some members, and as doubtful by others. The proper use of the electric range has to be studied, said Ralph J. Patterson, of the Central Maine Power Company. If the best results are to be obtained the fireless cooker principle gives electric cooking a distinct advantage over the gas range. Bread, pastry, custards and other foods can be cooked from a cold oven.

The mode of collecting the minimum monthly charge, when less than the equivalent in kilowatt-hours is used, was the topic for much discussion. One company's practice is to rebate the amount due the customer, at the end of the fiscal year, providing he has not used to the value of 75 cents a month, or $9 a year. If the minimum is not used during the last two or three months of the year, or if the customer discontinues service, the charge is adjusted on a pro rata basis. Another company has recently adopted a system of billing not less than the $1 minimum. July 1 adjustment is made of the accounts for the six months previous. If during the summer no current is used no bill is sent. Under a former system, the refunds amounted to 38 per cent.

Concentric Wiring.

The afternoon session opened with a discussion of concentric wiring, C. R. Hayes presiding. R. S. Hale, of the Boston Edison Company, referred to the introduction of the bare concentric system in the country as a central-station movement. The General Electric Company and other manufacturers have spent considerable money in producing the wire and fittings. There are no basic patents. Now it is up to the central station to go ahead. As it becomes more generally adopted the cost will steadily decrease, because of the larger demand for the materials, which will result in a larger volume of manufacture at lower unit costs.

Household Apparatus.

Rental of vacuum cleaners is the practice of the Pittsfield Electric Company. The charge is $1.50 per day when sent and brought back, and 75 cents if the customer gets and returns the apparatus. This helps to meet the cost of demonstrating household devices, and in reducing the depreciation cost.

Mr. Smith, of the Boston Edison Company's Range Division, held that a higher grade salesman is required for the sale of ranges, because a knowledge of construction and fittings is necessary. One division of the work is to cooperate with architects of apartment houses, to the end that provision may be made for electric cooking facilities in each suite. Though some 400 ranges have been sold by the Boston Edison Company during the past three months, Mr. Smith said the real campaign will begin in April, with 1,000 new installations by September as the end in view.

R. S. Hale explained the secondary two-cent rate, as applying only to cooking, heating and refrigeration. Fans and washers require so little power that there is no justification for a low rate. Mr. Hale justified the low rate for domestic uses on the grounds set forth in a decision by the Gas and Electric Light Commissioners in the Reading municipal case, in which the propriety of discriminatory prices for particular uses is recognized.

Ralph Patterson, Waterville, Maine, held that a three-cent rate for range operation is cheaper for the customer than gas. He believed that the householder who uses electricity for various purposes is entitled to be classed as a wholesale customer, and to enjoy a low rate on one meter.

Sessions of March 8.

C. R. Hayes presided at the morning session, when distribution problems were considered.

The use of Mazda C lamps on direct-current series street circuits was a subject of general discussion at this session. D. W. Beaman, of the New Bedford Company, reported that his company had such an installation. Early burnouts were traceable to carelessness or misunderstanding, but trouble is obviated by having the tub transformer set at full load before turning on the circuit.

In Worcester, on 6.6-ampere circuits, with eight lamps in series, renewals of burnouts cost more than the amount received for the use of the lamps. On four-ampere circuits, however, good results have been obtained with high-efficiency units on luminous-arc circuits.

Rockland, Me., reported that it had abandoned type C lamps for street series, and the Boston Edison Company regards their operation on direct-current arc circuits as impracticable, but on alternating-current series circuits good results have been obtained. The company has replaced all alternating-current arcs with these units.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

NOTEWORTHY ELECTRIC DEVELOPMENTS IN KANSAS CITY, KANS.

Electric-Service and Water-Pumping Station on the Missouri River Serves a Community of 100,000 Inhabitants.

Kansas City, Kans., is a city of 100,000 population, with no one among its population who is considered exceedingly wealthy. It has no millionaires, but it is the home of the stable middle class people, the factory workers and the employees of the packing establishments operating in the lowlands along the Missouri and Kansas rivers. The largest store in the city occupies but 62.5 feet front, with three stories and a basement, and the highest building in the city stands but five stories above the street. Apartment houses are almost a thing unknown, development having been distinctly extensive.

The electric plant was first started in November, 1912, supplying the entire city with street lights and about 200 domestic consumers. The lowering of the light rates, however, and the good service which the plant was able to give soon made the demands upon the plant greatly exceed the expectations of its most ardent supporters, also the demand for power service was such that in less than a year the capacity of the plan was doubled.

The plant was primarily built for a lighting proposition, and had for the first installation one 500 and one 1,000-kilowatt, 2,300-volt, 60-cycle, three-phase turbogenerators. Later another 3,000-kilowatt generator of the same make was installed and provision made for supplying power to private industries.

The domestic service demands during this time had been such that over 4,000 customers had been taken on and over 1,000 horsepower in power had been served. In the summer of 1914 it was discovered that owing to the excellent service being given and the increasing number of new industries being established in the city that the plant could, if enlarged, furnish several thousand horsepower, although the capacity of the plant was ample for lighting purposes.

In November, 1914, an additional 5,000-kilovolt-ampere generator was purchased, and is now in service. Additional space for another 3,000-kilovolt-ampere unit is provided.

Power is being furnished at 6,600 volts through step-up transformers, and provision is being made for supplying 10,000 horsepower.

The boiler equipment at present, for both the water and light departments, consists of five 350-horsepower, one 300-horsepower and four 500-horsepower, or a total of 3,700 horsepower. Space for additional boiler capacity of 4,000 horsepower is provided by widening the boiler room and erecting another stack.

The electric light plant is now selling approximately 1,000,000-kilowatt-hours per month. The demand for power and light is such that in two years' time the plant will show a net income of approximately $50,000 per year.

A 24-hour test run of the boiler plant, made February 2 and 3, 1915, under the directions of Professor Schaad, of the University of Kansas, showed an operating efficiency of 74 per cent, with the load varying from 750 to 1,850 horsepower during the run.

Electric Sign Designed to Withstand Heavy Wind Stresses.

The electric sign of the Overland Motor Car Company, of Kansas City, Mo., is an example of heavy sign work adapted to withstand extraordinary stress. The dimensions are 45 by 12 feet, and the entire device, including uprights and braces, weighs seven tons. This sign is situated on the roof of a three-story building, the building being on an

Electric Sign Designed for 90-Mile Winds.

eminence and the sign projecting into a wide thoroughfare, where winds get a clean sweep at it.

Kansas City occasionally has winds of 40 to 50 miles velocity. The sign was designed to withstand a wind velocity of 90 miles an hour, allowance also being made for sleet that might be deposited upon it. Among the factors of safety are guy wires every ten feet, each having a tensile strength of 5,000 pounds. The chief safety factor, however, consists in the special construction in the building to provide for the sign. When the structure was planned the sign was contracted for, and the architect planned the building to care for the additional stresses.

The sign was erected by the Federal Sign System, Kansas City, and has been in use two years. The letters are double-faced skeleton.

Central Maine Company Secures Hospital Contract.

A five-year contract for electric lighting of the Maine State Hospital at Augusta has been entered into with the Central Maine Power Company. The contract provides for the furnishing of all energy needed for light, heat and power, the first 150,000 kilowatt-hours per annum to be paid for at $3,000, and all hours in excess, at 1.5 cents per kilowatt-hour.

Central-Station Accident Prevention.

Many central-station companies have organized separate departments for supervising safety work. What has been accomplished by Henry L. Doherty and Company, operating about 70 utilities, is told by George O. Smith, supervisor of safety, in *Safety Engineering*.

Some two years ago a Safety and Welfare Department was formed by the Doherty organization to prosecute actively the work of accident prevention. The first work undertaken by this department was the study of methods in vogue. Not only other public-utility holding companies, but the large industrial companies of the country were canvassed. It was the theory of the Doherty organization that accident-prevention work was an absolutely necessary part of successfully operated public-utility companies, so it was rather in the nature of making this work a subdepartment of the operating department than to consider it in the light of some new element to be injected into public-utility operation. Further, it was considered that to be successful it must be conducted along entirely practical lines, and methods used which would fit in with operating conditions as they existed.

After some months spent on study and analysis, definite accident-prevention work was undertaken. Visits to the various subsidiary companies were made; examinations of their physical property and methods of operation conducted, and as a result of these examinations, recommendations were made, so far as physical property was concerned, that it might not present ways and means for the men to become injured. In addition to this, educational work among the employees was undertaken. This was done by means of general meetings and organizing safety committees, composed of the men from all branches of the organization.

In each subsidiary company, one man's entire time, if the company was large enough to warrant it, was devoted to accident-prevention work, and each of the subsidiary companies was assisted by the Central Safety Department, located in New York, in its endeavors along these lines. This assistance takes many and varied forms. A bulletin service is maintained by the Safety Department in New York and each of the companies avails itself of this service, and it stimulates interest of the men in their work. Uniform first-aid equipments, designed with a view to meet the peculiar conditions arising in the conduct of public-utility business, were distributed to local companies.

The Central Safety Department in New York, in addition to other service rendered, makes frequent inspections of the subsidiary company's plant and property, and gives advice to the local safety inspectors. It also furnishes lecturers, equipped with motion-picture films and lantern slides, to go to the different subsidiary companies and hold meetings. In fact every effort is made by the safety department in New York to keep in close touch with accident-prevention work in all local companies and give them the benefit, not only of its experience in this work, but to supply them with a great deal of information which will be of assistance.

The Doherty organization believes that an interest must first be aroused in the mind of the employee, and that the subject must be presented to him in such a way as to appeal particularly to him. He must then be taught to believe that by his efforts he can perhaps prevent injury to a fellow workman, and that by interesting a fellow workman an endless chain is started which has as its object the furtherance of safety first, last and all the time.

Frequently the companies in the Doherty organization are called upon to conduct campaigns, in cities in which they are located, dealing with accident prevention as applied to the public. Campaigns along this line have been conducted with very successful results, and the safety department always keeps itself in a position to render every class of assistance to local companies in this connection.

Statistics are kept by the Central Safety Department of the Doherty organization in its New York office, which show every accident to every employee, which are compiled in the form of reports and bulletins and sent to all employees. Each accident report receives very careful analysis.

The year's work has shown that accident prevention amongst the employees of the Doherty organization has been successful. The results have never been measured in dollars and cents only, nor is it the intention of the Doherty organization to consider the matter entirely in that light.

Absolute continuity of service is demanded in all public utilities, but there are many things upon which this depends, not the least of which is efficient accident-prevention work.

House-Wiring Campaign Planned by Nashville Company.

The vigorous prosecution of a campaign started some time ago will be the part played by the Nashville (Tenn.) Railway & Light Company and Nashville contractors in the national house-wiring campaign, beginning March 15. The advertising feature of this campaign is "A Year to Pay," and includes twelve payments without an initial cash payment The company is making a special appeal to tenants and owners of small houses. The campaign is based on the theory that all of the more expensive houses are already wired, and the chief source of new business is the small homes. The total wiring cost ranges from $11 for three rooms, paid at the rate of $1 a month, to $25.80, for a ten-room house, or $2.15 a month for twelve months. The work is divided among the local contractors, who depend upon the volume of business for securing a material profit.

Circulars setting forth in detail the advantages and economy of electric lighting under this plan are sent to all owners of unwired houses. In addition, similar circulars are sent to tenants, the names having been secured by canvass. By arrangment with the local postoffice, a circular addressed to a tenant who has moved is delivered to his successor, so that the house itself, irrespective of the resident, is reached. In addition a force of ten solicitors is to be placed at work during the month. The appeal is made to tenants that the cost is so low that it can hardly be noticed, and is more than repaid by the added comfort and cleanliness. It sometimes happens that tenants move before the wiring is fully paid for. The company has a lien on the wiring, but there has never been any occasion to exercise it. Practically always the landlord makes an arrangement with the next tenant by which the remainder of the cost is split between them. The percentage of loss, officials state, has been negligble. The plan is resulting in increasing the number of consumers rapidly.

At the beginning of the campaign it was stated that a cash payment would be required, but this was given in so few cases that the request for it was dropped.

Concession Regarding Discount for Prompt Payment.

The rates in force for residence and small-store lighting service on lines of the Commonwealth Edison Company, Chicago, have for some time been on a basis of 11, 6 and 4 cents, respectively, for the first, second and all subsequent 30 hours' use of the maximum demand. A discount of one cent per kilowatt-hour has been offered on each of these rates for prompt payment within 10 days of the date of the monthly bill. To encourage liberal use of current in excess of 60 hours' use of the rated maximum demand, which is covered by the primary and secondary rates, the company has, since February 1, billed all excess use at the rate of 3 cents per kilowatt-hour. In other words, the penalty for failure to pay promptly does not apply to any current used in excess of 60 hours of the maximum demand.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Electrolytic Refining of Tin—A New American Industry.

What promises to be an important new industry in this country has been started at Perth Amboy, N. J. The American Smelting & Refining Company has completed the erection at its works at that point of a new plant built particularly for the smelting of tin ores and concentrates and the electrolytic refining of tin. These ores will be obtained chiefly from Bolivia.

The consumption of tin has been rapidly increasing in this country. None has heretofore been mined or smelted here. About 45,000 tons of tin (valued at about $50,000,000) are imported annually, of which about 90 per cent comes from the Federated Malay States (Straits Settlements). An export duty on Straits tin ores has caused the smelting of the tin in that country, a very pure metal being produced which is especially suitable for tin plate. Aside from the Straits Settlements, Bolivia is the largest producer of tin ores and concentrates in the world; the Bolivian tin, however, contains impurities which, with the smelting methods long in vogue, do not produce a metal suitable for tin plate, the principal use for tin in this country.

Recent analysis of electrolytic tin made in England from Bolivian ores by the most experienced chemists in the tin trade shows it to run 99.98 per cent pure, while the base metal from which this was produced contained only 93 per cent tin. The impurities consist of lead, antimony, and copper, as well as small amounts of many other metals. Tests have also been made by tin-plate manufacturers of this electrolytic tin, and it is pronounced equal in every respect to the best Straits tin.

The new plant at Perth Amboy proposes not only to smelt the impure ores from Bolivia and other countries, but to refine the product electrolytically. The indications are that, after possible slight difficulties have been overcome, it will be a complete success, because the entire work, both smelting and electrolytic refining, is in the hands of expert men.

The Perth Amboy plant will utilize before long about 14,000 tons of tin ore shipped direct from Bolivia. Heretofore this ore has been smelted almost entirely in England and Germany. The new plant should therefore prove of great economic advantage.

Keen interest in the new development is being manifested by various American interests. Among these is the National Lead Company and other manufacturers of solder and tin alloys. The Chamber of Commerce of Portland, Ore., is taking lively interests in the direct importation of Bolivian tin ores and their smelting and refining in the United States. A syndicate at Seattle, Wash., is working on a project for the erection in that city of a smelter for handling the tin ores from its large Alaska mines and is also considering the importation of Bolivian tin ores. The salmon and fruit trades of the upper Pacific coast call for much tin in canning. The abundance of hydroelectric power in that region may aid materially in the production of the refined tin needed.

An important report on the new industry and on the world's trade in tin, covering over 14 pages, appears in *Commerce Reports* for January 6.

Purchased Power Shows Saving of $1,500 Yearly at Concord.

The town of Concord, Mass., is considering the question of purchasing its energy supply from the Edison Electric Illuminating Company, of Boston, which offers to furnish current from its Lexington substation, through duplicate underground lines, both energized, and either one capable of handling future requirements of the town.

The maximum one-half hourly load in December was about 320 kilowatts. A new electric sewage pump will require about 48,900 kilowatt-hours for the year, and this was added to present requirements, as follows:

	Kilowatt-hours.
Current generated at plant, year to June 30, 1915, including 56,000 kilowatt-hours for high service water pumping	861,940
Additional for sewage pumping	48,900
Total requirements	910,840
Total required, metered at high-tension, including transformer and saturation losses	930,000
Maximum one-half hourly load, December 8-22	320
Best demand to purchase 2,200 volts	275
Best demand to purchase high-tension	280
Probable excess hours at above demands	1,000

The cost of this current, at the Edison Company's high-tension wholesale "D" rate, would be $18,065, earning a rate of 1.94 cents a kilowatt-hour.

The company points out that maintenance and operation of the substation can be handled by the town for little additional expense. In Wellesley and Norwood, where Edison current is supplied, one attendant is on duty, only from 4 to 11 p. m.

In the comparative figures submitted, one operative is charged against the operating cost of the electric plant, and one against general expense and sewage and city water pumping.

In case the town should contract for 20 years, the company proposes to extend duplicate underground lines to the present station at its own expense. If at the end of 10 years it is desired by the town to terminate the contract, it may be done by the town paying the difference between the cost of the property, without interest or depreciation, and the appraised value. The company agrees to buy, and the town to sell, the steam and generating equipment which is now in use.

The "D" high-tension rate provides that the town furnish the transformers and substation equipment except the high-tension switching apparatus. Comparative costs would be as follows:

PRESENT OPERATING COSTS.

Year ending June 30, 1915.

Coal	$11,319.99	
Oil and waste	213.35	
Water service at station	47.60	
Wages	7,496.76	
Repairs—Real estate	753.07	
Steam plant	907.46	
Electric plant	74.40	
Station tools and apparatus	50.95	
		$20,863.58

OPERATION WITH EDISON SERVICE.

930,000 kilowatt-hours, 280 kilowatts—1,000 excess hours	$18,065.00	
One attendant, for switchboard operation	1,040.00	
Coal for heating substation, 20 tons @ $8.00	160.00	
Water, same as now	47.60	
		19,312.60
Saving with Edison current		$ 1,550.98

Talks to Central-Station Power Salesmen

Some Pertinent Comments on the Equipment of the Salesman and General Rules That Must Be Observed in Interesting the Prospect

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company

Of many remarkable developments in the central-station industry in recent years there is perhaps none that stands out with such particular prominence as does selling power. Ten years ago many central-station companies considered the signing of a 50-horsepower contract more or less of an innovation, and, therefore, an occasion for publicity and congratulations. Today a contract involving a revenue of ten to twenty thousand dollars per year is received with mild enthusiasm. Contracts involving fifty and one hundred thousand dollars and more per year are not exceptional at the present time, and many companies have reached the point where the power business represents 50 per cent or more of their entire station output.

With this rapid development it is obvious that the requirements of men to handle these propositions have grown in proportion. A few years ago the equipment of a power man was only that he should have technical knowledge of electricity, know something about the application of motors to tools, and perhaps be able to use some stereotyped arguments as to the advantages of electric drive in the smaller installations. Many times he only worked in an advisory capacity to the lighting salesman. Very seldom was he expected to take the initiative in getting power contracts, by presenting advanced sales arguments. Today, with propositions involving revenues such as referred to, it is necessary that the man who handles them must not only have a more thorough technical knowledge of the subject, but must needs be equipped with all the essential qualities of a high-class salesman.

At present there is a demand all over the country for capable men to sell power in large blocks, and it is doubtful if the supply is as great as the demand. This demand though, is not for the old type of power men, who knew the inner workings of a motor and the proper size belt necessary to couple it to a machine, as the colleges are turning out thousands of these men each year. The progressive central stations are looking for men that not only have a more complete engineering knowledge, but who are salesmen capable of handling propositions that involve ten to twenty or even one hundred thousand dollars per year revenue in a manner befitting their importance. It is the right proportion of this engineering knowledge and sales ability that makes the successful power salesman or power engineer, whichever he may be called. They are hard to find, and hence the demand. The field for such men is practically unlimited, and the demand undoubtedly will be far greater in the future than it is now. Therefore, it behooves a man who wants to go into this field, or who is in it now and not making much progress, to consider the qualifications experienced men have found most necessary, and train themselves accordingly. The writer agrees to a certain extent with several noted exponents in salesmanship, that salesmen are born and not made, and that if a man is not naturally endowed with certain requisite qualities which go to make up a successful salesman, it will be much better for the industry as a whole, and particularly to the man himself, if he places his efforts in some other branch of work towards which he has a natural leaning. However, there are a great many ways in which a man may develop himself along these lines, and much help may be given him by his superiors.

Prospective Customer Seldom Receptive.

Assuming then that we have a man who has the necessary equipment of technical knowledge, and at least the fundamental qualities of a salesman, it would be well to first get the proper viewpoints or conception of just what the proposition is. In this connection it is well to look at it from the standpoint of the prospective customer, as well as from that of the company. The position of a prospective customer is something like this: He is operating a private plant for supplying his power and light, in the firm belief that this is the cheapest way to obtain this product. He spent considerable good money for his plant, in the first place, has been operating it for a number of years, and knows that it is cheaper than would be energy purchased from the central-station company, as his engineers have told him so. Furthermore, his engineers have told him that all the steam that is used in the engine is used over again for heating the building. Thus the power does not cost much of anything. He has also had this confirmed by the men who sold him the plant, and perhaps by some consulting engineer, who was called in to report on its efficiency. He firmly believes that there are certain conditions affecting his particular enterprise which are particularly favorable to the operation of the private plant. Being a layman, he does not convince himself further, and aside from looking over the operating cost to see that one year does not exceed another, he continues to make his power. This is a logical sequence, as in his business there are many items to take up his time which have more important bearing upon the operation of his enterprise than does the question of power.

Such items as labor, raw material and the marketing of his product are the important factors in his business. He has employed men to supply his power in the most economical way possible, and as long as a private plant is used these men will probably have a job. If they should recommend the adoption of central-station power it is very likely that their services will no longer be required. Therefore, it is only natural that they should use every effort to convince the manufacturer that central-station service can only be adopted at a loss. Furthermore, these engineers probably do not know just how much coal is used for the production of power, and how much is used for heating and live-steam purposes. For this reason they need not stretch their conscience to any great extent to advise the owner that the greater part of the coal is used for the heating of the building and for furnishing live steam.

If the manufacturer is about to build a new building he has all the representatives of engine and boiler concerns and salesmen of plant apparatus calling on him, who, although each is there primarily to sell his own particular apparatus, are all working together against the consideration of central-station service, as this would be against their general proposition. All of which confirms the contention of his own engineers, that it is more economical to generate by private means. If at this point the central-station representative should succeed in making an impression against such an array of opposition, the manufacturer may turn the entire matter over to a consulting engineer to decide, and the consulting engineer may be prejudiced in favor of the plant for several reasons. His fee may be in proportion to the amount of money expended on the plant apparatus, and some manufacturers of plant equipment may give bonuses or commissions if their particular make of machine is recommended. It is also very probable that the manufacturer in making up the yearly cost of operating his plant does not consider all the items that properly belong to this account. Interest and depreciation are very often ignored, claims being made that the money has been spent and the plant has run for several years and will run for many more. The yearly cost of taxes and insurance are also very often left out, and repairs not properly considered. The space which the plant occupies is very seldom considered as having a rental value, and usually the cost of executive attention and loss of time through breakdown is ignored. If the power requirements of this factory played a more important part in its operation, these different items would be given their proper value in the books of the company, but as this feature receives only a small part of the time and consideration of the owner it must necessarily suffer in this respect.

This briefly is the position that the average prospect is in, and to this may be added many special conditions, such as some erroneous idea that all public service companies are grasping monopolies, who give but little and take much.

Position of the Central Station.

Of course, from the standpoint of the central station it is all quite different. We know that if our rates are even close to the cost of operating a private plant that the manufacturer has no more real excuse to make his own power than he has to make his own clothes. We know that he should be spending his time and energy on the larger items affecting his business, and that he cannot afford to carry the responsibility of a plant, if he can put it on another's shoulders. We know his heating from exhaust steam is not all velvet. We know his operating cost will increase with the steady advance in coal prices. We know that the fixed charges on his plant are vital items which go to make up a yearly cost, and that his plant takes up considerable space that could be used for some other apparatus if it were taken out. We know, further, that if he is considering a new plant that the representatives of engine and boiler concerns will make claims and even guarantees on their apparatus, which although possible under test conditions, have no particular bearing upon the everyday operation of a plant. We know that we have the best proposition for this manufacturer from all standpoints, and, if he will stop to think for a minute, we know that he will agree with us, if we can properly put these facts before him. As a shrewd business man he is open to reason, or he would not be where he is. Therefore, it is up to us, and if we call on him and come away without making an impression there is only one answer: We haven't put it up to him right. The proposition was all right, it was what he wanted, but we didn't convince him.

Talk to Prospect in Language He Can Understand.

Now the question is, what are the proper ways and means to convince a prospective customer of the merits of the service we have to offer, and to get his name on the dotted line. Here are a few suggestions:

First, it must be assumed that we have the necessary technical knowledge to handle the engineering features that present themselves, both mechanically and electrically, and that we can use this knowledge practically. We should have all the technical points of the game at our finger tips and be able to explain them so that the layman wil be able to know what we are talking about. The average manufacturer does not care how many heat units he has used during the year. He is in complete ignorance as to the relation of British thermal units to power, but he does know that his coal bill was $6,324.62. What he is vitally interested in is how to reduce that figure for the coming year. Therefore, we must be able to explain the B.T.U.'s, K.W.H.'s, K.V.A.'s, etc., in the equivalents of dollars and cents, if our arguments are to bear weight. Also, in testing out a plant we must mix our technical results with horse sense, to see that they sound reasonable. For instance, if we are making a load test on a plant we should at the same time get the output of the factory for that day to see if it is an average condition. Sometimes the engineer has been known to throw on an extra load while the test is being made, which shows the power consumption to be much greater than it normally would be. If it is a textile mill, the weather conditions have a bearing upon the power requirements, and if the product is governed more or less by seasons, proper addition or deductions must be made. In figuring the amount of coal necessary to heat the building the peculiar conditions of the premises under consideration have an all important bearing. There are so many different elements that are important factors in these calculations that each building must be considered almost in a class by itself. Taking any given condition and applying to it several standard formulae on heating, the results obtained will be far apart. The best data that can be obtained on this subject are those which the central station is in a position to get itself by making a tabulation of the amount of coal actually used during a heating season in some of the buildings which it is supplying with power, and giving in detail the specifications of such buildings.

Salesmen Must Keep Posted on Current Topics.

We must not only have this technical training, but there is a broader field of knowledge with which we must be equipped to successfully handle these larger deals. We must be in active touch with the social and economic developments of our community. These are matters of vast importance to the manufacturer, and will furnish us with a common topic of conversation with him. Not only this, but such items have a direct bearing on the future growth of the power business. A new manufacturer contemplating the erection of a plant wants to definitely know what class of labor he can obtain, what the working hours will be, approximately what wages he will have to pay, and the

shipping facilities and freight rates to different parts of the country. The successful power engineer must have more than a general knowledge of such conditions in order to approach the customer not only as a solicitor of a power contract, but as a man capable of discussing the entire economic aspect of the business in question.

Salesmanship cannot be governed by any hard and fast rules, and large blocks of power are not sold in the same manner as other commodities. Any salesman must have enthusiasm and confidence in his work, and this holds particularly true in the selling of power. The power salesman need not try hard to be very enthusiastic with his proposition. He need only to consider that he is the direct representative of one of the largest and best established institutions in his community, is following a profession equal to the best, and he is marketing a product which is even conceded by his competitors to be second to none. With these facts in mind he surely should have the necessary confidence to go with his proposition to the biggest concerns and men in his community, and feel that he is not in the class of an agent or a petty salesman, but that he has a perfect right to be there and to present his arguments. If the proposition be one where a new plant is involved and competition is keen from the makers of plant apparatus, the salesman must be firmly convinced that he has the best proposition and is the best man on the job. This last point is very necessary, as any salesman to be successful must have absolute confidence in himself as being "the best salesman on the job." The salesman who goes after a contract thinking that the man who is trying to sell the engine is a better man than he, has the battle lost before he starts.

After the salesman has the customer interested, of course there is a great deal of technical work done in testing out the plant and preparing a report, but as this part of the business will be taken up in detail in another issue of this publication, we will, for the time being, assume that such work has been done, that the report has been submitted.

Diplomacy a Necessary Qualification.

Although confidence is very necessary, too much confidence may be detrimental to the cause, for although a salesman has a perfect right to a belief in his proposition, the prospective customer also has certain rights to his belief that he is operating more economically by private means, and the salesman very often makes the mistake in not recognizing these rights. A manufacturer does not particularly care to have a salesman go into his office and tell him in so many words that he has been wrong in the management of his business. This reflects on his business integrity, and he is sometimes very justly antagonized. This manufacturer is willing to be shown that he has been wrong, but it must be done in a diplomatic way.

Some Points to Remember.

The arguments used inclosing a contract, after the figures have been submitted, vary more or less according to the nature of the particular proposition in hand. In some cases, the figures show such a material saving over the cost of operating the private plant that it is only necessary to convince the manufacturer that they are correct and that "now is the time to make the change." Where the figures submitted are comparatively close to those of the private plant, special stress must be laid upon the convenience, reliability, adaptability, flexibility and many other advantages of central-station power over any other. Economy in operation for overtime work is a most important point, and constant speed, which means an increase in the output of the factory, cannot be over-emphasized, as sometimes a very small percentage of increase in the factory output will amount to as much in money at the end of the year as a much larger percentage of decrease in the power item. The up-to-date manufacturer, as a rule, realizes most of these points, that is, in a general way he knows that electricity is the best power, and that, if supplied by the central-station company, it is the most reliable, but it is up to the salesman to emphasize and elaborate on these advantages and show how each one is of direct and vital importance to this particular manufacturer's business. He must show where his proposition is sound and conservative, as the central station must not only get a customer, but keep a customer in order to show a profit, while the engine dealer is practically through with the deal when the engine is sold. Where the manufacturer brings up the argument that he has been approached by the agent of some producer-gas plant that will make a kilowatt-hour on a pound of coal, the salesman's best argument is that when these plants or any other prime movers will reduce the coal consumption to any appreciable extent, the first people to put them in will be the central stations—and that they will work day and night to get them installed.

E. E. I. Co., Brooklyn—Power Eng. Bur.

CONCRETE .....

Occupied as	Shoe Factory	System Direct 1 Pipe	
Exposure	Total	Sq. ft. Rad. Sur.	15,000
Plot	60 × 200	Boilers 2-80 H.P.	Fire tube
Stories	8	Steam Pressure	B. 80 lb. H. 4-6 lb.
Sq. ft. fl. sp	96,000	Kind of Coal	No. 1 Buck
Ht. of Ceiling	13 feet	Avg. Build. Temp.	68°
Cu. Contents	1,248,000 cu. ft.	Max. Daily Coal	4½ Gross Tons
Exp. Glass Area	35,120	Avg. Daily Coal	3¼ Gross Tons
Exp. Area	52,680	Sum. Daily Coal	½ Gross Ton
North Exp.	20,800	Total Tons per Season	
Thick. of Wall	23 inches	Heating Tons per Season	453
Thick. of Glass	Single	Daily Avg. sq. ft. per lb. coal	15.58
		Daily Avg. cu. ft. per lb. coal	202.25

Remarks:—
Glass area exposed unusually large.

Date 4-5-13 Subject HEATING Page 2-B

Form Used for Tabulating Heating Specifications.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Maladjustment of Motors.

It sometimes seems as though better co-operation might be obtainable between electrical manufacturers and manufacturers of machines to which motors are applied, to insure correct adjustment of the electrical equipment when it finally arrives at the customer's plant. A recent case in question illustrates the point and is typical of a number of cases of varying nature which have arisen within the writer's experience.

An interpole motor was purchased for individual drive of a certain machine tool. The motor was shipped by the maker directly to the machine-tool manufacturer to be mounted upon the tool, the whole unit to be delivered thence to the purchaser. Mounting of the motor involved changing from floor mounting to side suspension. The change was made at the machine-tool plant by simply throwing the bearing flanges 90 degrees. This reversed the armature without reversing the interpole, hence the rotation was reversed and the relative interpole direction was incorrect. This fact was noted and corrected by the purchaser.

But another trouble arose. The motor was of the type having the brush studs rigidly connected to the bearing flanges, brush shift being secured by throwing the entire commutator and flange. At the machine-tool factory the flange had been rotated approximately 90 degrees; near enough so as to bring the oil wells on the bottom side, but far enough from the exact amount to cause the brushes to be considerably off neutral. After the interpole connection had been reversed to avoid the excessive sparking, the motor showed a tendency to race when run under a light field at high speed. Further tests located the off-neutral position of the brushes. This fault being corrected, the motor operated excellently.

In this particular case no great injury was done through the incorrect adjustment of the motor upon its arrival at the customer's plant. But, under less favorable circumstances, or had the tool gone to a small user not versed in the ways of motors, considerable trouble might have ensued and no little expense might have been involved, with injury, perhaps, to the motor manufacturer not wholly warranted.

Would it not be well if the tool makers had the fact well impressed upon them that motors should not be tampered with except under the direction of a certain authorized employee to whom should be explained the necessary procedure and to whom should be furnished simple printed instructions covering the points involved?

Gordon Fox.

Use of Lead Plugs When Expansion Bolts Are Not Available.

In many cases in securing conduit, cutout cabinets and various other electrical appliances, to brick, stone and concrete walls, where expansion bolts are not available to secure same, it is customary to use wooden plugs driven into the holes that are drilled and then put wood screws into the plugs. These do not give a very good support, as in time the wood dries out and the plugs work loose.

When expansion bolts are not at hand, I find that a good and satisfactory support can be had by using a piece of sheet lead or wire solder, which should be well packed and hammered into the hole, completely filling same, and thus make a good, tight fit; a nail or center punch can be used for making a hole in the center of the lead, to take whatever size wood screw is desired.

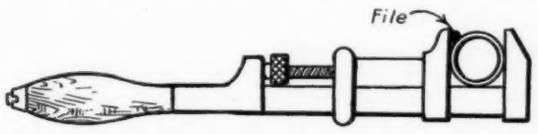
Where better support is desirable, a larger hole should be drilled and a carriage bolt or stove bolt with washer can be used, the head of same to be placed in hole, leaving the threaded end with the nut projecting from the hole. Sheet lead should be packed securely around the bolt with hammer and chisel.

Both these schemes have been in successful use, but a great many wiremen still use the unreliable wood plugs.

Otto Weber.

Improvised Pipe Wrench.

Several times when a pipe or Stillson wrench was not convenient, but a monkey wrench was on hand, I have



An Improvised Pipe Wrench.

made use of the following expedient, which I believe many wiremen are not familiar with.

Draw the jaws of the monkey wrench to size of pipe, rod, bar or fitting, then put a short piece of round file between material to be turned and lower jaw; see diagram of the wrench. The file will roll and grip between the jaw and work, taking the place of a regular pipe wrench.

This arrangement will take more time than using the proper tool, but it is certainly worth knowing in a pinch.

Robert Oster.

Wiring Data for Direct and Alternating-Current Motors.

The third edition of a book with the foregoing title has just been published by the Underwriters' Equitable Rating Bureau, Portland, Ore. It has been compiled by F. D. Weber, electrical inspector of this bureau, and the present, or 1916, edition has been fully brought up to date. Included in the booklet are many valuable hints, tables and formulas useful in installing direct-current and alternating-current motors of various types. Among other features are specifications for the installation of several types of motors. Aside from the numerous wiring data and tables for various types of induction and other motors, there are also tables on stranded copper conductors, copper busbars, etc.

Copies of this booklet, which contains 32 pages, can be obtained from the Underwriters' Equitable Rating Bureau, Lumbermen's Building, Portland, Oregon, for 20 cents each.

Chicago Electrical Rules Revised.

In accordance with its custom of revising every two years the rules and regulations covering the installation of all electrical wires and apparatus in the city of Chicago, the municipal department of gas and electricity has just issued the 1916 edition of the Chicago Electrical Code. As usual, the Chicago Code follows quite closely the National Electrical Code, even as to the numbering of the various rules and sections thereof. However, in many cases its requirements call for a higher standard of construction than is specified in the National Code, whereas, in a few cases the requirements are somewhat more liberal than those of the National Code. Since the Chicago rules are a guide to many cities, the chief changes therein are briefly summarized in the following:

Rules 1*c* and 8*a*.—Generator and Motor Frames.—New rules require the base frames to be permanently grounded. The former rule required the frames insulated.

8*c*.—Small Motors.—Vacuum-cleaner motors of three horsepower or less, in residence and apartment buildings, may be connected to lighting mains of No. 6 B. & S. gauge or over.

8*d*.—Autostarters.—The casings of autostarters must be grounded.

11*b*.—Instrument Transformers.—Cases of instrument transformers must be grounded, unless they are properly guarded.

12*c* and 12*f*.—Overhead Services.—Additional specifications for overhead service connections.

12*i* to 12*m*.—Underground Services.—A junction box must be placed over the service stub, and wires from the stub to the service switch must be run in conduit.

14*a*.—Transformers.—Must not be attached to walls of buildings, but must be mounted on poles or placed in standard vaults.

15*a*.—Grounding Low-Potential Circuits.—Neutral wires must be effectively grounded.

18*a*.—Carrying Capacity of Wires.—Additional rule at end of table limiting wires in parallel to 500,000 circular mils or over.

19*a*.—Switches and Automatic Cutouts.—Location of trip coils specified for two and three-phase circuits.

19*c*.—Switches.—Requires that switches and cutouts located in wet places, or outside of buildings, must be mounted in weatherproof cutout boxes.

23*a*.—Cutouts.—Service switches may be so connected that current comes to switch first. That is, the fuse does not have to protect the switch. When the switch is connected in this way it must be so arranged that the blades are dead when the switch is open.

23*b*.—Neutral Fuses.—The fuse must be omitted in the neutral wire, except in two-wire mains or branches.

23*d*.—Branch Circuits.—New rule requires sufficient circuits to provide one circuit for every 880 square feet, or fraction thereof, of floor space. The method of determining sizes of mains and service is explained. Previous rule required a circuit for every 660 square feet of floor space; new rule decreases this to 0.75 watt per square foot.

23*e*.—Cutouts.—Additional rule on paralleling of fuses.

24*b*.—Knife Switches.—Requires that knife switches be inclosed in dust-tight cabinets.

24*c*.—Switches.—Additional rule forbids use of single-pole switches on circuits located in wet places.

24*d*.—Floor Outlets.—Change in rule allows ordinary outlet box to be used for floor outlets in varnished, waxed or carpeted floors on wood joists, and requires the cutout box to be equipped with a cover which leaves no opening when attachment plug is removed.

26*c*.—Wires.—Rule requires all exposed work to be installed in conduit, armored cable or metal molding.

26*l*.—Metal Molding.—Additional rule allows four wires in metal molding.

26*n*.—Wires.—Allows use of single-braid wire not larger than No. 6 B. & S. gauge in conduit.

26*p*.—Wires in Conduit.—Change in rule allows installation of 12 wires in a single conduit, in place of 10, as previously specified, without special permission; latter must be obtained for installation of more than 12 wires in single conduit.

27*b*.—Armored Cable.—Change in rule requires exposed armored cable to be protected by iron pipe where it passes through any floor.

27*c*.—Armored-Cable Grounds.—Addition to rule allows armored cable to be grounded to cold-water pipes only, and requires protection for ground wire.

28*d*.—Conduit Outlet Boxes.—Addition to rule requires support of outlet boxes.

28*f*.—Conduit Grounds.—Addition to rule allows conduit to be grounded to cold-water pipes only, and requires ground wire to be run in conduit for protection, except that where the largest wire in the conduit system does not exceed No. 0 B. & S. gauge; the conduit may be used to serve as the ground wire.

28*k*.—Size of Conduit.—New rules specify the sizes of conduit for the different sizes of wire.

29*d*.—Metal-Molding Grounds.—Addition to rule allows metal molding to be grounded to cold-water pipes only, and requires ground wire to be protected.

30*a*.—Fixtures.—Special attention is called to approved methods of supporting fixtures.

31*d*.—Socket Bushings.—Sockets for drop cords must have an inlet of three-eighth-inch pipe size. This rule becomes effective April 15, 1916.

35.—Gas-Filled Lamps.—New rules covering the installation of gas-filled incandescent lamps.

38*c*.—Theater Switchboards.—Must be of the dead-front type.

38*v*.—Special Motion-Picture Machines for Slow-Burning Films.—Must be of approved type and installed in accordance with an ordinance passed by the City Council, January 24, 1916.

38*Ad*.—Schools.—Wiring for class-room lights must be kept independent of wiring for assembly-hall lights.

38*C*.—Garages.—Additions and changes made in rules covering garages. In private garages a portable lamp must be installed before certificate is issued.

39*A*.—Festoon Lighting.—New rules covering the wiring of temporary and permanent festoons.

45*b* to *d*.—Transformer Vaults.—New rules give specifications for transformer vaults.

50*c*.—Single-Braid Wire.—Permits use of single-braid wire, in sizes from Nos. 14 to 8, inclusive, in conduit.

68*f*.—Fuses.—Classification of fuses from 0 to 30 amperes changed to allow the use of plug fuses on all 220-volt circuits on three-wire system with grounded neutral.

70*a*.—Cutout Cabinets.—If there are more than four circuits the cabinet must have a gutter at the side or a wiring space back of the cutout blocks, unless the circuits leave the cabinet directly opposite their terminal connections. This rule becomes effective May 15, 1916.

77*a*.—Fixtures—Outdoor fixtures or others exposed to moisture must be constructed so that water cannot enter wireways, sockets or other electrical parts.

81*g* to *i*.—Toy Transformers.—Additional rules giving specifications for toy transformers.

The new edition of the rules also contains as a supplement specifications covering the installation and wiring of fire-pump motors. Also numerous sketches showing location of meter fittings and size of meter board required in such installations. Ordinances relating to electrical work, inspection and licenses are also included.

Direct-Method Job Cost for Contractors

By George W. Hill

In this article, which is the fifth of the present series by Mr. Hill, the importance to the contractor of an accurate and yet simple accounting system is pointed out in order that he may set an intelligent selling price for the work he undertakes to execute. A very simple job-cost system is described and illustrated. Other articles by Mr. Hill on accounting methods will follow in subsequent issues.

The income-tax law, which is already in force, and other laws of a similar nature which will no doubt be enacted have made it necessary to keep a much more comprehensive system of accounts than the very simple forms which have done service for a large majority of mechanical contractors.

In addition to this the banks are becoming more strict in regard to statements required from their patrons, and jobbers and manufacturers are declining to extend credit, without satisfactory evidence of the strength and business methods of their customers.

The successful business man of the future must keep in close touch with his business affairs, in order to keep his business properly balanced, and to meet these needs several different designs of job-cost records have been produced, but the writer believes the form represented in the accompanying cut is the most simple, comprehensive and direct method he has ever seen.

Need for Accurate Accounting by Contractors.

Too many contractors are satisfied to know that they have secured the job, and the very fact that they have received it in competition with others who are conducting their business in a more or less haphazard manner causes them actually to fear to know the results of this particular job. My admonition to this misled and misguided brother is to grab your business by the ears at least once each month and look it fearlessly in the face. Be brave. Don't be afraid to know the truth about the results of your business as a whole or in part. It may require some courage, I admit, but it's the only sure way to success. If you have not a comprehensive accounting system in your business from which you can produce a financial statement readily, you are at sea, and you should use care not to permit your creditors to find this out.

An accounting system is to the contractor what the com-

JOB COST AND SALES RECORD

THE MODERN MECHANICAL CONTRACTORS ACCOUNTING SYSTEM — DESIGNED AND PUBLISHED EXCLUSIVELY BY THE N. & W. ACCOUNTING BUREAU, ROCK ISLAND, ILLINOIS

JOB NO. 300

MR L. D. McKinley

CONTRACT $ 750.00

MEMO

STARTED 11/16 19__ FINISHED 12/30 19__

DATE BILLED 12/30 LEDGER FOLIO ✓

WORKMAN 41	HOURS 42	TOTAL TIME 43	@ 44	AMOUNT 45
Jones	Dec 20 6/8, 21 7/8, 22 7/8, 23 7/8, 24 7/8, 25 7/8	46	50	23
Smith	20 7/8, 21 7/8, 23 7/8, 24 7/8, 25 7/8	40	50	20
Martin	20 7/8, 26 7/8, 27 7/8, 29 7/8, 29 1/4	36	50	18
Hill	27 1/5, 30 1/4	9	60	5 40
				66 40

ESTIMATED QUANTITY 29	KIND OF MATERIAL 30	QUANTITIES TAKEN 31	RETURNED 32	USED 33	COST COLUMNS 34	35	36	SELLING COLUMNS 37	38	39	CASH SALES 40
	FORWARD						1007 18			1527 48	214 10
5000	½" Conduit	2000-2000-2000	600	5400	04	216					
900	¾" "	500-300	60	740	08	59	20				
200	1" "	200-50	40	210	12	25	20				
40	¾ Elbows	20	00	20	10	2	00				
10	1" "	10	00	10	15	1	50				
6000	#14 Duplex	3000-3000-500	200	6300	02	126	00				
750	10 "	1000	250	750	04	30	00				
400	6 D B R C	500	40	460	05	23	00				
60	Outlet Box	60	00	60	10	6	00				
30	NR Flush Sw	30	00	30	40	12	00				
6	3 Way Flush	6	00	6	60	3	60				
72%	Labor					66	40	510 90			
	Tools										
	Bender	1	1	0 To running on							
	Bench Vise	1	1	0 your Contract						750 00	
	8 ft Ladder	1	1	0							
	FORWARD						1578 08			2277 48	214 10

Job Cost and Sales Record for Contractors.

pass is to the sea captain. It guides his course, and if you haven't a system with which to guide your course you are in as much danger of going on the rocks as is the sea captain.

I find the most successful men in the contracting business are those who know their costs and who are able, from their records, to tell me their percentages of profit or loss on any certain-sized job.

The fallacious policy of conducting business in a haphazard manner has become so prevalent in this country that it has attracted the attention of our Federal Trade Commission, and on July 10 last there appeared an article in the Chicago *Herald*, by E. N. Hurley, vice-chairman of the Commission, which advocated strongly governmental aid (not interference) to the small business men in the way of providing them with some simple yet comprehensive accounting system.

Intelligent Selling Price.

Mr. Hurley said: "Teach them to know their costs, that they may intelligently set a selling price." Why does he say this? Simply for the reason that it has been discovered that the smaller business men, yes, some of the larger ones also, are not setting an intelligent price.

I take it that an intelligent selling price would be one which would carry with it a reasonable profit. Anything sold at a profit must be sold at a price in excess of all costs. The writer desires to relate an occurance while he was traveling in the South, which might interest many in this connection:

I called upon one of the larger contractors in a thriving city many miles below the Mason and Dixon line. After the usual salutation this contractor brought up the question of overhead by asking me what I thought was the average overhead per cent of the contractors of the country. I told him that I believed the average overhead was about 40 per cent. He replied that he was surely under the wire all right, as his overhead was only 17 per cent. I then asked him how much he was adding for profit. He replied: "Twenty per cent." I said to him: "Look here, you are either doing a much larger business than I think you are, or your overhead is more than 17 per cent, for I can see that much overhead standing around here looking at us and wondering who that pale-faced Yankee is and what he is doing down here." He insisted that he was right. I then asked him how much gross business he was doing. He told me. I then figured his profit based on the percentage he had given for profit, and his profit should have been something like $6,000. I said to him: "Now, Mr. ———, if your figures are correct, you have something like $6,000 more this year than you had last, either in the bank, in property, or in some available asset. Where is it?" He stammered some, and replied that he was not quite sure where it was. I finally made him a proposition that I would remain in his city a couple of days and run over his last year's books roughly with him, and see if we could not find that $6,000. We took the books into a private room that afternoon and began our investigation. On the second evening we finished a rough draft or abstract of the situation; it developed that his overhead was, roughly speaking, 30 per cent. No wonder he could not find his $6,000. He had given it away to his customers. It is admitted, however, that perhaps if he had set an intelligent selling price he would not have done so much business in competition with others who were conducting their business along similar lines, or perhaps, worse, but he was expending energy for nothing. He could have just as well taken life easy and probably had as much, if not more, and been much better satisfied with the result.

Job-Cost System.

The job-cost system in question consists of a spring-back binder for work in progress, a cost binder for completed business and the blank forms. The blanks combine the principle of direct-cost accounting (which is the most accurate method of obtaining costs) with a sales record and show at a glance:

First. The amount of labor and material which has been charged to a job.

Second. The amount of labor and material due on a job, according to the estimate.

Third. The gross profits accruing when the job is completed.

How to Handle a Contract.

The first step toward securing a contract is a proposal to the owner or agent to do a certain thing for a certain amount of money or consideration. This sum of money represents the cost of the various materials which will be required, the cost of the labor necessary to install this material, the overhead or general operating expenses, and the profit. The summary of these items is called the estimate, a description of which was published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN under date of January 29, 1916.

We will assume that the proposal has been made and accepted and the contract awarded. The job should now be given a number and started through on the job-cost sheets. See illustration herewith.

Enter the number of the job, the name of the owner, and location of the building. The contract price may also be entered, if desirable. Enter in column 29 the quantity and in column 30 the kind of material required according to the estimate sheet. As the charge slips covering the material sent on the job are received in the office, the amount or quantities are entered in column 31 on the same line with the estimated quantities. If more of the same kind of material is sent later enter as before, in column 31, with a short dash between the quantities, thus: 2,000—2,000—2,000 feet. This shows that a total of 6,000 feet has been taken to date. If during the progress, or at the completion of the job, material should be returned, enter the amount so returned in column 32 on the same line as the charge. If 600 feet was returned from the job and entered in column 32 and 6,000 feet had been charged out, as shown in column 31, it will be readily seen that 5,400 feet has been used, which amount should be placed in column 33. If the cost of this item was four cents per foot, this $0.04 would be entered in column 34. The cost of 5,400 feet at four cents per foot would be $216, and should be placed in column 35. Each item should be treated in the same manner. The labor is taken into account at the top of the sheet. Enter the name of the workman in column 41. Enter date and hours worked in column 42. Thus: Jones—December 20/6, 21/8, 22/8, 23/8, 24/8, 25/8, making 46 hours. Enter the total hours, which would be 46 in column 43, and the rate per hour in column 44. If the rate was 50 cents per hour the amount would be $23, which would be placed in column 45. The footing of column 45 represents the cost of labor on the job. When the job is completed the word "Labor" should be written in column 30, and the amount, as shown by column 45, is entered in column 35. This column is then footed up, and the amount placed in column 36, which shows the total cost of material and labor ($570.90) used on the job.

All transactions, where labor or material or both are sold, whether contract, time-and-material or cash sales, are treated exactly alike up to this point. To obtain the selling price on time-and-material work enter the unit selling price (or price for each) in column 37, the prices for the quanity used in column 38, and the footing of column 38 in column 39.

You are now ready to make the invoice. As soon as the job or charge is completed, an invoice should be made and mailed to your customer. The amount to be billed is shown

in column 33, the kind of material in column 30, the unit price in column 37, the amount of each item in column 38, and the total amount of the charge in column 39. If the job is a contract the price is entered in column 39, leaving columns 37 and 38 blank.

The sheets should then be transferred to the post binder, paged, and the charge posted. In the event of cash sales enter the items exactly as in the time-and-material job, and treat in the same manner, except that the footing of column 38 is placed in column 40, leaving column 39 blank.

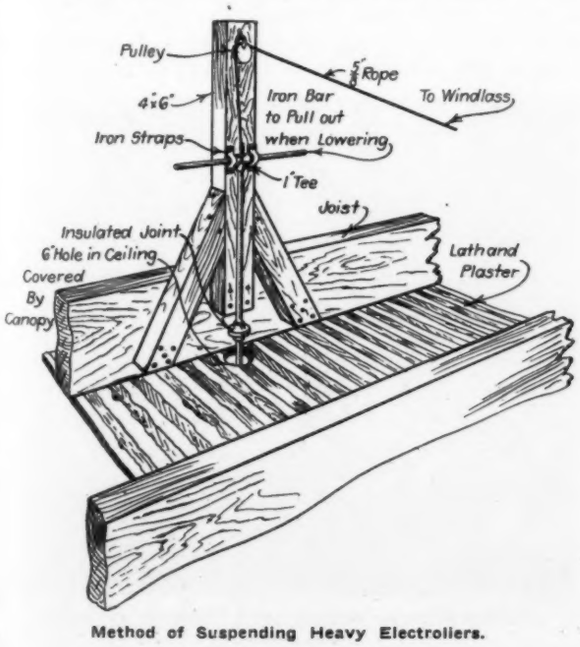
A job-cost system very similar to this has been in use in the office of the Electric Construction & Machinery Company, Rock Island, Ill., for nearly 15 years, and has proved to be a valuable record. You will notice that the difference between columns 36 and 39 or 40 shows at a glance the gross profit. This sheet is a very complete history of the job from beginning to end, and instantly shows the result desired, what has been the gross profit or loss; from this can be readily determined whether the gross profit is sufficient to cover overhead and a reasonable net profit. It affords an opportunity of checking the estimator on every particular item entering into the job; comparing column 33 with column 29 produces the evidence at once.

The ELECTRICAL REVIEW AND WESTERN ELECTRICIAN will be pleased to furnish full-sized samples of the system, as descriped, with the exception of the binders.

It is the intention of the writer to follow this article with others on accounting methods, and to furnish cuts of blanks carrying the entire accounting to a final conclusion, showing the use of the multi-column journal, an especially designed ledger, and a most simple yet comprehensive profit-and-loss statement and financial statement. The following article will cover a unit-cost time-card system and pay-roll blanks.

Method of Suspending Heavy Electroliers for a Church.

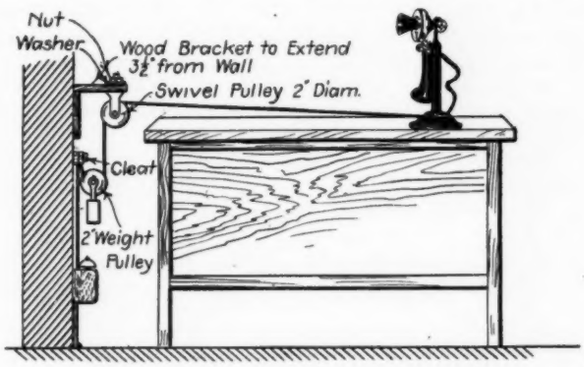
In a recent job of wiring a large church I had a problem of arranging a mounting for some heavy electroliers in such a way as to permit lowering the fixtures for lamp renewal and cleaning. The fixtures were installed so high as to make it impracticable to reach them by a ladder. The method of mounting the fixture is shown in the accompanying diagram, which is practically self-explanatory. When the fixture is to be lowered, it is disconnected from its supply wires through convenient insulated couplings and the iron bar which passes through the top of the fixture stem is pulled out. The fixture then can be lowered by means of the windlass and pulley arrangement. It is to be noted that ordinarily the weight of the fixture is not supported by the rope and pulleys. This prevents subjecting the rope to continual strain, which would not be very safe. The supply wires are not shown in the diagram for the sake of simplicity. J. B. Story.



Method of Suspending Heavy Electroliers.

To Take Up Slack in Telephone Cords.

We have had quite a little trouble in our office from telephone cords getting tangled up by themselves and mixed among drawings and papers on a flat-top desk or table. We have two telephones, a Bell instrument and an automatic, that are kept side by side for convenience. I arranged the simple scheme shown in the drawing to remedy this trouble. Only one telephone is shown for the sake of simplicity. We actually have two sets of pulleys and two weights side by side to take up the slack in each telephone cord independently. The cords are never tangled now. F. C. Petersen.



Method for Taking Up Slack in a Telephone Cord.

How to Find Conduit for Combination of Wire Sizes.

The four tables forming rule 28*i* of the National Electrical Code give the trade size of conduit to be used for various numbers of wires of any one size. They do not give the proper size of conduit, however, where a combination of wires of different size are to be used. This matter has been nicely solved by Washington Devereux, of Philadelphia, Pa., to whom we are indebted for the following.

In order to readily determine the proper size of conduit to be used for a combination of wire sizes, the table below may be used to advantage.

For example: What size of conduit is required for four No. 8 and three No. 10 B. & S. wires?

Answer: According to the National Electrical Code, four No. 8 wires require one-inch conduit, three No. 10 wires require three-fourths-inch conduit. Equivalent area of one-inch conduit as given below is 1. Equivalent area of three-fourths-inch conduit is 0.5. Adding these areas we have 1.5. The nearest size of conduit to equivalent area of 1.5 is one-and-one-quarter-inch conduit.

Conduit Sizes.	Equivalent Area.
½	0.25
¾	0.50
1	1.00
1¼	1.50
1½	2.25
2	4.00
2½	6.25
3	9.00

THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

Novel Advertising Scheme for the Electrical Dealer.

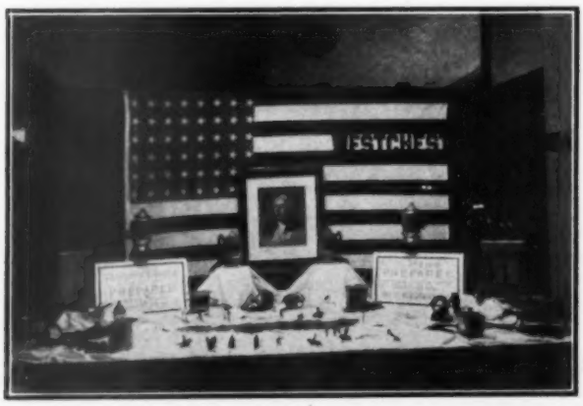
An electrical goods and novelty store in Southern California has devised a unique publicity plan for increasing trade and good will. By promoting the sale of postage stamps in its advertisements in local papers and capitalizing this universal product the shop has become known throughout the community and is making new friends and customers every day.

In connection with an advertising appropriation for the regular electrical specialties handled, arrangement is made for incorporating in each announcement, with panel border and attractive style, some little fact regarding the particular service along postal lines that the store is in position to render. Smaller individual announcements also are printed from time to time dealing specifically with the sale of postage stamps.

The message of "Postage Stamps for Sale," arranged as the important feature of the advertisement, is so novel and unusual that it catches the eye and arouses curiosity. It carries the idea of utmost service, convenience and satisfaction to the customer, not only in the furnishing of postage stamps but indirectly in the sale of the regular merchandise handled. This appreciative spirit cannot help but draw people into the store. Circulars and boosters issued at frequent intervals to set forth some special sale of electrical goods also give useful postal information and make a special point of the fact that postage stamps are available. These activities make to individualize the store and impress its advantages upon local consumers.

Through this original plan of promoting the sale of postage stamps, the shop is far out-distancing its former records for business. People are induced to enter who otherwise would hardly be likely to do so. After making any stamp purchases at a special postal desk arranged for the purpose, they are permitted to look around without interference, and many an order is received for stock merchandise.

This store has had the enterprise to see the substantial trade and good-will to be derived through building upon a spirit of added convenience to customers and possible customers. Realizing the frequent difficulty and inconvenience met with in obtaining postage stamps, it has capitalized this general commodity in a way to bring unusual interest in its establishment, with direct results in increased sales in electrical goods.



An Attractive Window Display for Washington's Birthday—Preparedness is Emphasized.

MONTHLY COMPETITION RESULTS IN EFFICIENT AND TIMELY WINDOW DISPLAYS.

By H. Thurston Owens.

The Westchester Lighting Company, of Mount Vernon, N. Y., operates in six districts, those of Mount Vernon, New Rochelle, Port Chester, White Plains, Tarrytown and Yonkers. In each of these cities the company maintains a show room for the sale of electrical appliances, and has succeeded in keeping up a keen interest in window displays by means of monthly competitions.

The "Lincoln" and "Washington" window displays illustrated, while attractive in their arrangements and ideas presented, have a note of timeliness that makes a positive appeal. One of the signs in the "Washington's Birthday" window read: "Washington at Valley Forge was getting prepared for his spring campaign against the British." The other sign read: "We are now prepared to help you in your spring campaign against hard work. 'Do it electrically.'" Thus a note of preparedness was combined with that of timeliness.

In the "Lincoln Birthday" window was shown an axe, the means used by the "rail-splitter" in doing the work. In the same window the work was shown as being done in the modern way by an electric motor. Thus, with timeliness was combined motion. The latter element can be made most effective, and usually can be applied directly to the apparatus or commodity for sale, as instanced in this window display.

E. S. Bellows, the treasurer of the company, is highly gratified with the results obtained to date and is giving the men in the commercial department every assistance to make these displays the success they evidence.

Lincoln's Birthday Window which Combines Timeliness with Motion.

A METHOD OF SIMPLIFYING COLLECTION RECORDS FOR THE MERCHANDISER.

By W. B. Parker.

This is the third of a series of four articles on the subject of collection and credit efficiency. The first two, which appeared in recent issues, indicated a practical and inexpensive method of taking care of slow accounts by mail, and the diplomacy necessary in handling the various classes of slow debtors. This article will deal with a different, but fully as important, part of the work of the collection department—the keeping of all collection records in such simple yet systematic form as will make for regular and prompt attention to the slow accounts with the least effort on the part of this department.

It is so undoubtedly true that many slow accounts are actually lost through inattention, due in large part to cumbersome records, that it is not necessary to dwell on this fact. The experience of every collection manager will verify this, but, while some have profited by the knowledge, many have felt that a thoroughly efficient system was too expensive for them to adopt, both in first cost and the expense of upkeep. This belief, however, is far from the fact. It is the lack of such a system that is truly expensive. Even an energetic collection manager is apt to neglect giving his slow accounts the proper attention if it is necessary to go through the ledger to ascertain the exact status of each one. Even in a small business memory is a very uncertain substitute for handy records. The proper attention to slow accounts is the only means of clearing them up, and Mr. Debtor will be quick to note that his account is being watched closely if every promise to pay is followed up at the right time.

If Mr. Debtor's account is overdue this should automatically come to the attention of the manager at brief and regular periods. Also if Mr. Debtor promises a payment at a certain date the promise should also be remembered at the right time. Experience has proved that no ledger system, either old style, loose leaf or card, will produce these results except at a time-cost so great that few men can spare it. The right method is to keep a separate card record of all accounts that are past due, and to keep this record partially in duplicate. That is, there should be an alphabetical card record, giving all the ledger data as well as notations of promises to pay in the future, and there should also be a chronological card record which will call the attention of the collection manager to each of these accounts at the right time.

At first thought it might seem that such a system would be still more cumbersome as well as too expensive, but this idea is based on the supposed necessity of installing regular card filing cases, ordering specially printed cards, and overlooking the slight amount of time actually required to keep up such a record, as well as the time saved in having the data wanted in handy form to get at. While a regular filing equipment, including specially printed and ruled cards, is a fine thing to have, yet it is quite possible to get the same results with a couple of cigar boxes and cards cut from old stock that can be found at any printer's. It is thus possible for the smallest business to make use of the most efficient business methods without the usual cost.

The important point is to have the method of keeping the records as nearly automatic as possible. When the monthly statements are made out each overdue account should be entered on the duplicate card system mentioned. The accompanying form of entry will be found very convenient.

This card shows at a glance a past due balance of $251.10, and a promise to pay February 20. It is a handy record to refer to in case more credit is requested before settlement is made and no printed card or special ruling is required in order to carry out the idea.

At the same time this card is made out another one should be filed in the chronological file to come up February 20 with simply the name of the debtor on it, so that attention will be called to this account at exactly the right time. In the case of past-due accounts, where no promises have been made, the card should come up weekly until some definite arrangement has been secured. Where a filing clerk is employed it should be his duty to bring these cards to the collection manager daily, with the morning mail.

In the absence of a regular filing clerk it should be made a matter of the first importance for the collection manager himself to take up the cards daily as well as to attend personally to the making of the proper notations and the proper filing. The time required is so little that it is merely a question of getting into the habit. There is another way of handling that some managers prefer when taking personal charge of the collection files, and this is what is known as the signal system. Various colored clips are utilized, each color representing a different day in the week. Where this system is used a chronological file is not required as the clips are placed on the cards in the alphabetical file with a different colored clip to indicate

Mr. Slow Pay,
Chicago, Ill.

Charges				Payments		
1/1/16	160	80	2/5 Promised balance 2/20	1/5/16	100	00
1/7/16	240	30		1/15/16	50	00

Suggestion for Duplicate Card System for Entering Names of Customers Whose Accounts are Overdue.

the particular week in the month that the day clip refers to. This method does not appeal to the writer as being as simple and effective as the chronological file, but it is certainly better than making no effort at all to bring accounts up for attention at the proper date.

In one large business house, where the writer was at one time employed, the method of making the proper notations on the cards and keeping them up to date was as follows: When the mail came in it was opened by the office boy at a table next to the bookkeeper's desk. Any mail containing remittances was handed to the bookkeeper, who made the proper entry in the ledger and then sent the letters on to the credit man, who could then make the proper entries on his alphabetical card files, answer any part of the letter that pertained to his department, and pass them on to the sales manager. The mail not containing remittances followed the same route, except that it did not require the attention of the bookkeeper.

In this connection there is another point worth at least passing attention, and that is that one of two rules should be made and rigidly adhered to. Either only the collection manager and filing clerk should be allowed access to the cards at all, or, if others are allowed to look them over, they should not be allowed to take them out of the box. Many persons, especially the younger clerks, are often careless as to the proper return of filing cards to the files, and carelessness of this kind is liable at any time to prove exceedingly costly.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Fittings for Use in Installations of Concentric Wire.

On account of the agitation in favor of concentric wiring which has been going on for over a year, special interest attaches to the line of fittings which has recently been developed for use with concentric wire. This type of wire and also the special fittings for it are being manufactured by the General Electric Company, Schenectady, N. Y.

The movement in favor of concentric wiring has exploited this system almost exclusively for use in small houses whose owners probably cannot afford to put in the standard systems of wiring now in use on account of their relatively high cost. Therefore, the concentric system is expected to be installed almost entirely as a surface wiring system and all of the fittings for it described in this article are based on the use of the wire on wall and ceiling surfaces, which will permit of installation without disturbing wall decorations to any great extent. The way in which such an installation can be made is shown in the large accompanying diagram, Fig. 1. This shows not only the general system followed in running from outlet to outlet, but also the actual fittings, and their corresponding catalog numbers, best suited for each particular place.

The bare concentric wire, a sample of which is shown in Fig. 2 with a portion of its outer sheath pulled up, is primarily an inner conductor, surrounded by a rubber insulation and braid, which is protected on the outside by

Fig. 2.—Sample of Concentric Wire.

a metal sheath that has a current-carrying capacity at least as large as that of the central wire. The diameter of the finished wire is 0.22 inch. The inner conductor is a No. 14 B. & S. single-braided, rubber-insulated, solid wire, which conforms as far as insulation is concerned to the National Electrical Code standard. The outer conductor, which also serves as a protecting sheath, is made of tinned sheet copper folded longitudinally around the wire with a full

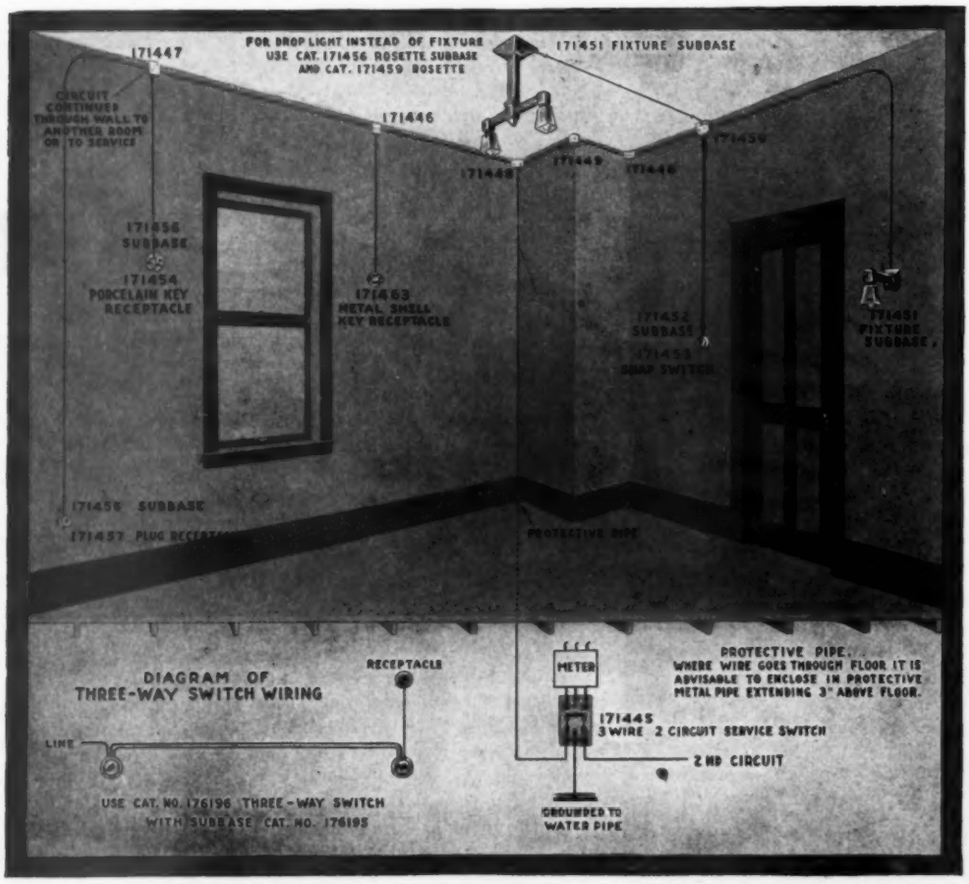

171447
FOR DROP LIGHT INSTEAD OF FIXTURE USE CAT. 171456 ROSETTE SUBBASE AND CAT. 171459 ROSETTE
171451 FIXTURE SUBBASE
CIRCUIT CONTINUED THROUGH WALL TO ANOTHER ROOM OR TO SERVICE
171446
171448
171449
171446
171450
171456 SUBBASE
171454 PORCELAIN KEY RECEPTACLE
171463 METAL SHELL KEY RECEPTACLE
171452 SUBBASE
171453 SNAP SWITCH
171451 FIXTURE SUBBASE
171456 SUBBASE
171457 PLUG RECEPTACLE
PROTECTIVE PIPE
DIAGRAM OF THREE-WAY SWITCH WIRING
RECEPTACLE
LINE
USE CAT. NO. 176196 THREE-WAY SWITCH WITH SUBBASE CAT. NO. 176195
METER
PROTECTIVE PIPE. WHERE WIRE GOES THROUGH FLOOR IT IS ADVISABLE TO ENCLOSE IN PROTECTIVE METAL PIPE EXTENDING 3" ABOVE FLOOR.
171445 3 WIRE 2 CIRCUIT SERVICE SWITCH
2 ND CIRCUIT
GROUNDED TO WATER PIPE

Fig. 1.—Typical Installation of Concentric Wire, Showing Fittings Especially Suitable Therefor.

Fig. 3.

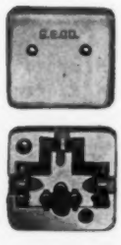


Fig. 4.

Fig. 5.

lap, giving double thickness throughout. The sheath is soldered where it overlaps so as to form a continuous watertight and gas-tight jacket, having in itself a conductivity and carrying capacity larger than that of No. 12 B. & S. wire.

The fittings developed for use with this wire are intended

Fig. 6.

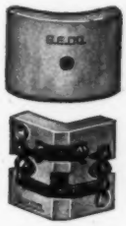


Fig. 7.

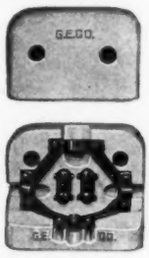


Fig. 8.

for use on single circuits or 660-watt branch circuits. All of the fittings are so arranged that joints between the wires and fittings can be quickly and well made by expert wiremen. The fittings are so designed that the grounded sheath is continuous throughout the system. The use of solder in making joints is considered inadvisable because of the possibility of injuring the rubber insulation of the inner wire. The outer sheath must be carefully grounded at the service switch and possibly at other points so as to insure that the whole system is thoroughly grounded.

A combined switch and plug cutout arranged as a two-circuit, three-wire device is shown in Fig. 3. As shown in the large view, this switch can be used as the service switch. The middle point is the ground, or neutral wire which is connected to the outer sheath. Edison plug fuses are used with this switch. Figs. 4 and 5 show three-way and four-way branch junction boxes. In these it will be observed that a strap is provided in each outlet by means of which the outer sheaths of the wires are thoroughly connected together. Figs. 6 and 7 show corner junction boxes, of which the former is arranged for an inside corner and the latter for an outside corner. The covers of these devices have been removed so as to show their interior arrangement. The straps for connecting the sheaths and the connecting busbars are also clearly shown. A junction box for a snap-switch circuit is shown in Fig. 8.

Fig. 9 shows a supporting base on which can be connected either pendent or bracket lighting fixtures. Fig. 10 is a subbase for a snap switch, in this case the switch being of the single-pole type. A similar fitting is made for three-way snap switches. Fig. 11 shows a single-pole, five-ampere, indicating snap switch designed for 125 volts.

Fig. 12 is a subbase for lamp receptacles, wall receptacles and rosettes. A rosette is shown in Fig. 13. This is a porcelain device which in external appearance is identical whether the rosette is of the fused or fuseless type. A separable type of porcelain receptacle is shown in Fig. 14, on which is mounted a polarity cap. Fig. 15 shows a porcelain key receptacle; this is also made in the keyless type. A key receptacle with porcelain base and of the fluted-catch type is shown in Fig. 16; this device is also made in the keyless and pull types. A typical socket of the fluted-catch type is shown in Fig. 17; similar sockets are also made of the key and pull-chain type; all of these are provided with one-eighth inch caps.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

For supporting the concentric wire, clamps of the type shown in Fig. 18 are used. It has been found that the use of a few special tools greatly facilitates the installation of this wire. Special pliers for cutting and stripping concentric wire have, therefore, been made (Fig. 19). A bending tool, shown in Fig. 20, facilitates and insures making proper bends in the wire.

Although the various fittings shown herewith are designed only for surface wiring, and surface switches and receptacles, a line of flush switches and flush plug receptacles is now being developed to make this system adaptable to semi-concealed use.

A number of installations of the concentric system using these devices have been made, but since this has not yet been approved and recognized in the National Electrical Code, such installations require a special permit from local insurance bureaus or municipal inspection departments.

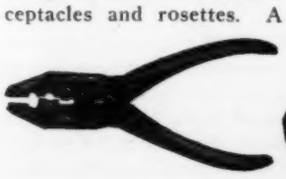


Fig. 19.

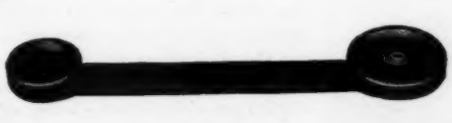


Fig. 20.

Improved Construction for Duraduct Flexible Non-metallic Conduit.

An improved construction has been followed for some time in the manufacture of Duraduct flexible non-metallic conduit, and this improvement has been so successful that public announcement thereof has been made. The conduit tube is woven of natural warp-twist cotton yarns on tubular looms especially constructed for the purpose. This tube is treated with the best known waterproofing and fireproofing compounds, making the finished conduit thoroughly safe against the two destructive agencies of water and fire. Due to the construction of the body of the tube from the highest-grade cotton yarns, a structure is obtained which allows the insulating and protective compounds to thoroughly permeate the entire wall of the tube; the ordinary methods of making fiber conduit do not provide for such thorough penetration and consequently a mere surface protection is obtained. The finished con-

duit is of superior quality than any rules or specifications laid down in the National Electrical Code or any other regulations require. By the new and improved construction, both the interwoven wall and the roller-bearing wireway, which have made this type of duct so favorably known in the past, have been retained.

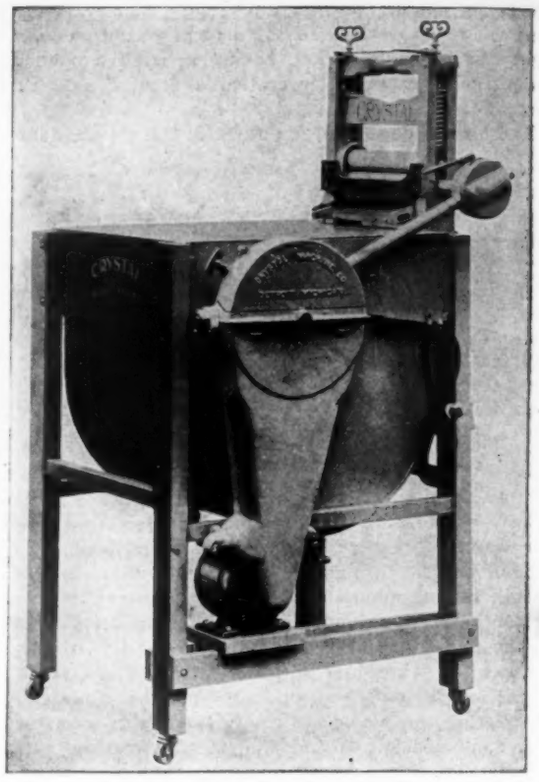
Duraduct is manufactured by the Tubular Woven Fabric Company, Pawtucket, R. I. It is sold exclusively by A. Hall Berry, 97 Warren Street, New York City.

The Crystal Dish-Washing and Clothes-Washing Machines.

There are many tasks of drudgery about a woman's housework that are now eliminated by that ever-willing and untiring servant, the electric motor. The electric dish-washer and the electric clothes-washer and wringer, for example, are booms to the housewife. Two new types of these machines are illustrated herewith.

The simple, solidly constructed Crystal dish-washer is equipped with electric motor, pump, cord, plug and switch, and sewer connection. The dishes are placed in racks to hold the plates, cups, glasses, silverware, etc., and the water is forced through and over them by means of the pump. The dishes do not move and breakage is therefore impossible. After the first washing the dirty water is drawn out and hot, clean rinsing water is put in. This rinses, sterilizes and leaves the dishes so hot, that when the washer is opened the dishes are dry and all ready to be put away. The formerly disagreeable dish-washing is thus done without even wetting the hands and yet with a great saving in time and labor and great safety for the glass or china.

The Crystal clothes-washer, which is also manufactured by the Crystal Machine Company, of Detroit, Mich., has a different design from other washers of the cylinder type and is said to be particularly effective. The cylinder does not reverse but the clothes do reverse inside it, due to the unique construction of the cylinder. This elimination of the reversing feature allows a marked saving in maintenance. The clothes in the Crystal cylinder are raised out of the water and dropped back into it continuously, taking fresh suds, air and steam with them. This combines the tumbling process with the recognized advantages of the vacuum process and gives the Crystal machine a distinctive cleansing power. Every moving part in the mechanism of this washer is entirely inclosed, thus removing all danger of being caught in the mechanism in any way. The wringer can be swung down out of the way, leaving the machine with a flat top which can be used as a stand when the washer is not being used for washing.



Electric Clothes-Washing Machine.

Electric Dish-Washing Machine.

Both these Crystal machines are driven by Westinghouse splashproof motors which are fully protected against moisture and have ample ventilation to insure cool running. There are no exposed electrical contacts, so the motor, as well as all working parts about the machines, are protected.

Electric Foot Warmer for Traffic Policemen.

Pittsburgh's traffic policemen have gone through a rather severe winter with no frost-bitten toes. The officers who stand at the windy street corners regulating vehicle traffic have kept their feet warm. The secret is in the appliance known as the "Tootsietherm."

Early in the winter the City Council took up the subject of installing some device that would assure comfort to the policemen whose duties keep them at street intersections nine or ten hours every week day. Drew Johnston, of the Duquesne Light Company, was called into consultation as an expert and the result was a practical foot-warmer. Its success was immediate and several other cities have made inquiry concerning the Tootsietherm. It is quite probable this electric heater will be installed by the public safety departments in many of the larger cities of the country before another winter season comes.

The first idea discussed in the Pittsburgh Council was to

Photo from Pittsburgh Industrial Development Commission.
Electric Foot Warmer in Use on Busy Pittsburgh Corner.

have a stationary heater on the curb but this would have made it necessary for the policeman to leave his post and would, on severe days, be a constant temptation to neglect duty and favor cold feet. Another proposal was that the heater be placed firmly in the paving, but the cost of installation would have been prohibitive for experimental purposes. The final decision was for a warming plate 18.5 inches square and 1.5 inches thick. It resembles a griddle and is connected with an electric plug and switch on a pole at the curb. The intermediate connection is a flexible armored conduit about ten feet long. The cornerman, when he leaves his post or when the weather is not severe, carries his heater to the curb and pulls the plug from the socket.

Mr. Johnston, when he had completed his plans, took the matter up with the experimental department of the Westinghouse Electric & Manufacturing Company and the heaters were made by it. The company is receiving inquiries, especially from cities in the northern part of the United States and from corporations that have employees at fixed outside stations.

The switch controlling the heater permits of four temperatures, which can be changed to meet the rigors of the weather. At no time does the foot plate develop a temperature that will burn the soles of the shoes. The idea is not so much to warm cold feet as to keep the feet from getting cold. For all ordinary weather conditions the heater can be operated on less current than is required for two ordinary 40-watt lamps, such as are used in residence illumination.

The accompanying photograph shows Policeman C. L. Dye, of the Pittsburgh traffic squad, at his station, Sixth Avenue and Smithfield Street. This is one of the most congested street intersections in the country.

Dumore Electric Cloth Cutter for Tailors and Dressmakers.

One of the largest elements in the tailoring cost of a suit of clothes, overcoat or other garment is in the cutting of the goods; the cutters are high-priced men who are experts in laying out and cutting the cloth to the best advantage. This is true of clothing manufacturers and dressmakers as well as of custom tailors. Therefore anything that facilitates the work of the cutter is in the line of efficiency and reduced production

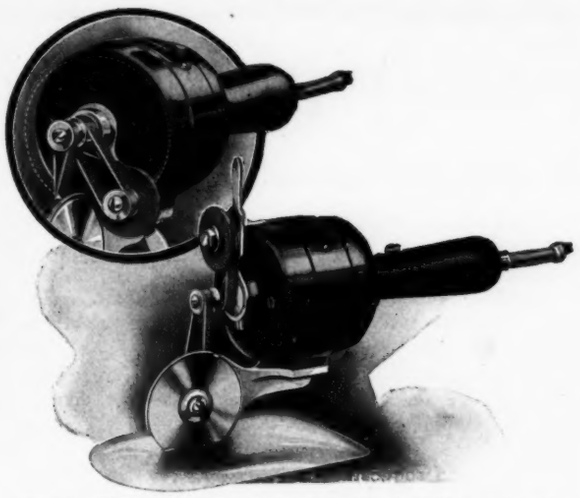


Fig. 1.—Electric Cloth Cutter and Method of Sharpening It.

cost. A means of improving the efficiency of the cutter is by relieving him of the burden of actually cutting the goods by hand with tailor's shears or knife.

In large clothing shops this has been done to a large extent by means of electric cloth-cutting machines, which have heretofore been made only in quite large sizes suitable for cutting through some 20 or more layers of cloth at one operation. To meet the evident need of smaller shops and of all tailors for a machine that would cut one, two, three or so layers, there has been now placed on the market a handy electric appliance especially designed for this purpose. It is particularly suitable for work on overcoatings and similar heavy goods, the hand cutting of which is slow and tiresome.

The machine is compact and light in weight, making it easy to handle. It is equipped with a small Dumore universal motor that can be operated on either direct-current or alternating-current circuits and takes only a very small current. It operates at a speed of 6,000 revolutions per minute. Through a belt it drives the cutting wheel, thus eliminating the noise of gears. The blade edge of the wheel has a razor-like edge, which is easily maintained in perfect condition; a special emery wheel for the purpose is included in the outfit.

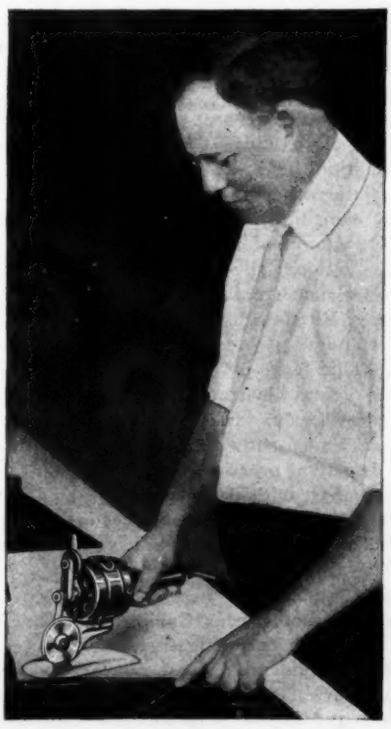


Fig. 2.—Dumore Cloth Cutter in Use.

In the main part of Fig. 1 it is shown turned up; in the insert at the upper left corner the emery wheel is shown turned down against the cutting blade so as to grind it to a hollow-ground edge. The blade is protected by a guard, the lower part of which acts as a support and guide.

This cloth cutter is made by the Wisconsin Electric Company, Racine, Wis.

INDUSTRY ACTIVITIES

Wesco Supply Company, St. Louis, Mo., has issued a supplement and discount sheet which applies to its Catalog No. 200.

The Globe Stove & Range Company, Kokomo, Ind., held the first of its 1916 sales conferences for its electrical department at the home office March 16-18.

R. Martens & Company, 24 State Street, New York City, has prepared an economic map of Russia for distribution among manufacturers interested in the development of United States foreign trade in Russia. Copies may be obtained upon request.

Daniel W. Mead and F. W. Scheidenhelm, consulting engineers, announce their association in the practice of engineering with offices in the Equitable Building, 120 Broadway, New York City. They will continue to give their attention to reports, designs and construction, covering hydraulic and electric developments, water supply and reclamation works.

Stow Manufacturing Company, Binghamton, N. Y., manufacturer of flexible shafting for electric-motor or rope transmission, announce that a special arrangement has been made with the American Express Company for the execution of orders by customers in foreign countries. No buying commissions are charged, only those for handling credits or remittances being made.

The Electric Service Supplies Company, manufacturer of railway material and electrical supplies, Philadelphia, Pa., has issued the March number of the "Keystone Traveller," which illustrates and describes Keystone triangle arms truss pins, and ground clamps, lightning arresters, rail bonds and other electrical devices manufactured by the company. The headlight and lamp business of the Esterline Company, Indianapolis, Ind., recently has been purchased by the Electric Service Supplies Company, thus increasing the variety of its railway specialties.

Panama-Pacific Medal-Winners' Exposition.—Hughes Electric Heating Company, Chicago, Ill., winner of a gold medal for electric ranges and ovens at the Panama-Pacific Exposition, maintained an exhibit at the Panama-Pacific Medal-Winners' Exposition, held at the Coliseum, Chicago, March 1-12. Among the other exhibitors identified with the electrical industry were the Dover Manufacturing Company, Canal Dover, O., winner of a gold medal for electric irons; Mathias Klein & Sons, silver medal for linemen's, electricians' and mechanicians' tools.

Hubbard & Company, Pittsburgh, Pa., has issued a complete catalog of its standard pole-line hardware and construction specialties. This book is an encyclopedia of line material, each article being illustrated and a description and table of dimensions given. In many instances illustrations and detail drawings show the manner in which the material is used in actual practice. The book contains 260 pages, 8.5 by 10 inches, with flexible cover, and is intended for use as a handbook by overhead construction linemen. Over 17,000 copies of the book have been distributed to the electrical trade, and a copy will be sent free to anyone making request.

The Emerson Electric Manufacturing Company, St. Louis, Mo., in the March issue of its publication, the Emerson *Monthly*, calls attention to the profits that can be made by dealers on fan-motor spare parts. Dealers who have more than an occasional demand for parts can handle them at a substantial increase in profit by ordering those commonly required in dozen lots. Ceiling-fan blades, blade flanges, balls, bearings, switches, switch handles and switch covers are parts constantly called for in sections where ceiling fans are in general use. Desk-fan blades of the 12 and 16-inch sizes, suitable for either oscillating or non-oscillating fans, can advantageously be purchased in dozen lots and carried in stock. The Emerson company and other fan manufacturers offer a substantial discount to dealers on such orders.

The Snyder Electric Furnace Company, Chicago, Ill., has recently added Robert M. Keeney to its staff of metallurgical engineers, and he will be in charge of all development work for the company. Mr. Keeney has had a broad experience in electric furnace research, covering the production of iron, steel and ferroalloys in the electric furnace, and the electric smelting of lead, copper and zinc ores. He has visited many electric furnace plants in Sweden, England, France and Germany. Before his connection with the Snyder Electric Furnace Company, Mr. Keeney was electrometallurgist of the United States Bureau of Mines at Pittsburgh, Pa., and Salt Lake City, Utah; mill superintendent of the Baker Mines Company, Cornucopia, Ore., and metallurgist of the Standard Chemical Company, Canonsburg, Pa. In the latter connection Mr. Keeney was engaged in the production of ferrovanadium and developed a process for the manufacture of ferrouranium. While in the western states, he made an extended study of the application of the electric furnace to the smelting of ores, flotation, concentrate and cyanide precipitates.

Westinghouse Club Banquet.—At the sixth annual banquet of the Westinghouse interests in the Pittsburgh district, held under the auspices of the Westinghouse Club, March 11, at the Fort Pitt Hotel, the principal speaker was W. L. Saunders, vice-chairman of the Naval Consulting Board, and chairman of the board of directors of the Ingersoll-Rand Company, New York City. Mr. Saunders chose for his subject, "Industrial Preparedness for Peace and War," and in the course of his remarks said: "If the industrial strength of the United States became known, no foreign country would dare attack us. The United States is the largest and richest of all industrial nations, and it is industrial wealth which offers the greatest protection to a nation in time of war. It is obvious that this industrial wealth cannot be utilized in full measure unless it is organized, and it is obvious that it takes a long time to organize a country so big as the United States, hence the importance of beginning now to place our industries in a position where they will respond quickly and fully to the needs of the Government in case of trouble." A plan has been formulated by the Naval Consulting Board, involving a directorate of five engineers in each of the forty-eight states of the Union. These men have been selected by their respective engineering societies and will have the aid of all other engineers in the states in tabulating and correlating our industrial resources. There were about 500 Westinghouse men present, who were welcomed by President G. H. Lewis, who in turn introduced the toastmaster, Truman P. Gaylord, acting vice-president of the Westinghouse Electric & Manufacturing Company. The other speakers were Wesley G. Carr, patent attorney of the Electric Company, who spoke on "The Potency of Service," and the Rev. Samuel M. Lindsay, of Pittsburgh, who spoke on "Imagination and Life."

PERSONAL AND BIOGRAPHICAL

MR. ROBERT FERRIS, who was elected president of the South Dakota Power Association, an organization of central-station owners formed at Sioux Falls February 22, is secretary-treasurer of the Yankton (S. D.) Light, Heat & Power Company, president of the Watertown (S. D.) Light & Power Company, and secretary of the Osage (Iowa) Light, Heat & Power Company. Mr. Ferris was born in Scotland in 1870 and came to this country in 1879 with his parents, who settled in Lowell, Mass. He spent the early years of his business career in fac-

Robert Ferris.

tories in the East, specializing in the production of electrical machinery. Later he became a salesman and was in the Chicago offices of the General Electric Company for some time. During 1900, he and three of his brothers formed the "Ferris Brothers System," which owned and operated public utilities in Indiana, Illinois, Iowa and South Dakota. Mr. Ferris was president of the Yankton Commercial Association for two terms and now represents that association in the United States Chamber of Commerce. He is also a director of the Federal Reserve Bank of Minneapolis, Minn., and has many financial affiliations. Mr. Ferris resides in Yankton. The three brothers mentioned, all of whom were at one time connected with the General Electric Company, are MR. W. J. FERRIS, of the Electric Bond & Share Company, New York City; MR. THOMAS FERRIS, manager of the Osage (Iowa) Light & Power Company, and MR. JAMES W. FERRIS, manager of the Watertown Light, Heat & Power Company.

MR. THEODORE N. VAIL, president of the American Telephone & Telegraph Company, left New York City last week for an extended trip to Guatemala.

MR. H. C. MASON has resigned as general manager of the Benton Harbor-St. Joe (Mich.) Railway & Light Company, and is now in Alhambra, Cal., where he owns considerable property.

MR. NORMAN B. HICKOX, formerly with Thomas Cusack Company, Chicago, Ill., has resigned to accept a position in the Chicago offices of the National X-Ray Reflector Company.

MR. ALBERT J. SLAP, formerly manager of the Royal Eastern Electrical Supply Company, Bronx Branch, New York City, is now connected with the Harrislap Specialty Company of that city.

MR. THOMAS C. HAWKINS has been appointed western representative of the Holophane Glass Company, with headquarters at Chicago, Ill. His territory will include the middle western states.

MR. E. E. LARRABEE, manager of the Twin State Gas & Electric Company, Bennington, Vt., has been chosen a director of the New England Section, National Electric Light Association, to fill the vacancy due to the resignation of MR. W. H. VORCE, of St Albans, Vt.

MR. A. E. SMITH, who has been assistant secretary and assistant treasurer of the Electric Bond & Share Company, New York City, was recently elected treasurer and assistant secretary of the company, succeeding MR. E. W. HILL, who was elected a vice-president of the company.

MR. E. C. JOHNSTON has been appointed purchasing agent of the East St. Louis & Suburban Railway Company and associated companies, with headquarters at East St. Louis, Ill., succeeding MR. S. P. BROOME, formerly assistant purchasing agent, who has resigned. The appointment became effective March 1.

MR. R. J. CLARK, formerly comptroller of the Kansas City Railway & Light Company, has been appointed secretary and treasurer of the Kansas City Light & Power Company. The office of comptroller has been abolished. MR. T. R. HARBER, for 13 years with the light company, has been made purchasing agent of the Kansas City Light & Power Company.

MR. PRESSLEY H. BAILEY has been appointed commercial manager of the Harrisburg (Pa.) Light & Power Company to succeed R. W. Kiple, formerly of Easton, Pa., who died soon after he assumed the position. Mr. Bailey is well known in electrical engineering circles of the Middle West, having served nearly 14 years with the Logans Gas & Coal Company of Columbus, O., and the Louisville (Ky.) Gas & Electric Company.

MR. E. S. FLETCHER, formerly manager of the Temple and Taylor (Tex.) district of the Texas Power & Light Company, of Dallas, has been made assistant general manager of the entire system. Mr. Fletcher graduated from Cornell University, after which he became manager of the Temple power plant. When this plant was transferred to the Texas Power & Light Company, he was retained as manager and later made district manager. MR. F. W. WILKERSON, formerly manager of the Palestine (Tex.) plant of the same company, has been assigned the position made vacant by Mr. Fletcher's promotion.

MR. A. VON SCHLEGELL, for several years general manager of the Michigan State Telephone Company, has resigned that position and been made a vice-president of the company. Mr. Von Schlegell will hereafter be actively engaged in the executive and managerial work of the Hupp Motor Car Corporation, Detroit, Mich., of which he has become vice-president. For the past 21 years he has been active with the Bell System in Chicago and the Northwest

A. von Schlegell.

and as general manager of the Michigan State Telephone Company. MR. G. M. WELCH has succeeded Mr. Von Schlegell as active head of that company.

OBITUARY.

MR. J. C. HOOVEN, president of the Hooven, Owens, Reutschler Company, Hamilton, O., died at Hamilton March 1. Mr. Hooven has been identified with the manufacture of steam engines and machinery for many years, and his death will be mourned by his large circle of personal and business friends.

MR. JULIEN P. FRIEZ, widely known for his work in the manufacture of scientific instruments, died March 9 in Baltimore, Md. He was with the General Electric Company for many years and made the first key and sounder for telegraph service for that company. He was the pioneer in the manufacture of the heliograph signal apparatus, used by the Government before electricity came into use. Mr. Friez assisted in the development of the Rowland multiplex telegraph system.

MR. MERRITT GALLY, credited with having patented nearly 500 devices affecting the telegraph, telephone, linotype, and player piano, died March 7 at his home in Brooklyn, N. Y. He was born in Rochester, N. Y., 76 years ago, and, after receiving his degree at the University of Rochester, went to Auburn Theological Seminary. Mr. Gally was one of the first to develop the multiplex telegraph system. He also tried to invent an instrument which would turn telegraphic messages into type for newspapers.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

PORTLAND, ME. — The Cumberland County Power & Light Company, W. M. Bradley, president, has been granted authority by the Public Utilities Commission to issue bonds to the amount of $250,000. Part of the issue will be used for extensions and improvements.

SWANTON, VT.—Plans for additional generating equipment for the municipal hydroelectric plant, C. J. Parker, superintendent, include two 500-kilowatt units and necessary auxiliaries.

CHELSEA, MASS.—City Engineer Maggi has prepared plans for additions to the present street-lighting system.

CHICOPEE, MASS. — Complete rearrangement of the city's street-lighting service will soon be necessary, according to a statement of Manager Benedict of the municipal electric lighting plant. Extensions and improvements in the feeder system are needed.

MILFORD, MASS.—The Milford Electric Light & Power Company is planning extensions to its high-tension distribution lines.

NEW BEDFORD, MASS.—Work on the new power plant of the New Bedford Gas & Edison Light Company is being rushed to completion. Arrangements have recently been made to supply electrical energy to two large spinning mills now being built here, and the additional facilities are necessary. The initial capacity of the new plant will be 22,000 kilowatts, provision being made for an ultimate capacity of 80,000 kilowatts.

NEWBURYPORT, MASS.—The Council has passed an order calling for the rearrangement of the city lighting system and for additional lamps.

NORTH ANDOVER, MASS.—Extensions to the municipal lighting system are being planned.

OSTERVILLE, MASS.—A transmission line from Falmouth and a distribution system for this city will be installed by the Buzzards Bay Electric Company of Falmouth.

WORCESTER, MASS.—The lighting committee of the City Council has recommended orders for 132 additional luminous arc lamps to be installed during the summer.

CHATHAM, N. Y.—The Chatham Electric Light, Heat & Power Company has filed with the Public Service Commission an application for permission to begin construction and exercise franchises and distribution systems in the towns of Austerlitz, Claverack, Hillsdale, Copake and Taghkanic. The application was accompanied by the local franchises for the extension of the company's lines.

LYONS, N. Y.—The report of the committee on ornamental street lighting, calling for the installation of 35 one-light concrete posts, probably will be adopted by the Municipal Board.

NEW LEBANON, N. Y.—The Lebanon Valley Lighting Company has given up its plans for the operation of a generating plant and is preparing to secure energy for distribution in the towns of New Lebanon and Canaan by means of a transmission line from Stockbridge, Mass.

NEW YORK, N. Y.—Plans have been filed for the power plant the New York Steam Company is to build at the northwest corner of Water Street and Burling Slip. It will be five stories, with a frontage of 116.8 feet on Water Street and 107.4 feet on the slip. Starrett & Van Vleck, architects, estimate the cost at $370,000.

UTICA, N. Y.—The New York Central Railroad will build a large electric lighting plant here, according to information received recently. With the opening of a new station here it is understood that more power will be needed, and the company is making arrangements to furnish its own power.

HARRISBURG, PA.—Twenty-seven electric companies which desire charters to operate in Mercer, Beaver and Lawrence Counties have petitioned the Public Service Commission for certificates of convenience preparatory to incorporation. The companies are projected by several groups of men and cover townships and boroughs.

WAYNESBORO, PA.—The Waynesboro Electric Light & Power Company contemplates the extension of its distribution lines to Mont Alto, in order to furnish electrical energy to the towns of Nunnery, Quincy, Goods Siding, Knapper and Mont Alto.

JANE LEW, W. VA.—If the plans of a number of representative citizens of Jane Lew and nearby country districts are carried out, a trolley line will be built from Jane Lew to Berlin during this summer. The new line would connect with the Monongahela Valley Traction Company's interurban line at Jane Lew.

WILLIAMSON, W. VA.—The Williamson Light & Ice Company is planning to build an electric lighting plant, ice factory and cold storage plant, to cost about $50,000.

DURHAM, N. C.—The Durham Traction Company is planning to install a 300-kilowatt rotary converter and additional switchboard equipment.

NASHVILLE, N. C.—Bonds in the sum of $45,000 have been voted for the establishment of electric lighting, water and sewerage plants.

UNIVERSITY, N. C.—The University of North Carolina has completed a fund of $40,000 which will be used for the installation of a heating and electric lighting plant to replace the present equipment.

ZEBULON, N. C.—An election will be held to vote on the question of issuing $10,000 bonds for the erection of an electric lighting plant.

COLUMBUS, GA.—The Columbus Power Company will establish a substation and install equipment at the Goat Rock station to increase the pressure from 13,200 to 66,000 volts. A substation will also be installed at Hogansville.

OCALA, FLA.—Bids will be received until March 30, by the City Council, for the construction and equipment of an electric lighting and power plant here. Twombly & Henney, 55 Liberty Street, New York City, are the engineers, and H. C. Sistrunk is city clerk.

WEBSTER, FLA.—E. W. Evans, of Brookville, has petitioned the City Council for a franchise to supply the city with electric service.

NORTH CENTRAL STATES.

CANTON, O.—Manager Golding, of the Canton Electric Company, is handling arrangements connected with the purchase of large power units for the new plant of the American Gas & Electric Company, near Wellsburg, W. Va., which is to cost $5,000,000 and have an ultimate capacity of 180,000 kilowatts. The plant is to be connected with Canton by transmission lines.

CINCINNATI, O.—The city of Norwood has sold $15,000 worth of bonds for the purpose of providing funds for the extension and improvement of its street-lighting system. Contracts will be let shortly.

CINCINNATI, O.—M. E. Springer, of Chatfield & Company, is in charge of a plan for the construction of a large building near Third and Vine Streets, which will include arrangements for large garage and repair-shop. Elevators and other equipment, besides the power and generating machinery necessary for a large building, will be required.

HAMILTON, O.—James O'Toole, superintendent of the municipal electric lighting plant, in a report to the City Council, has recommended the purchase of new generating and boiler equipment, an ornamental lighting system and other improvements, all to cost about $60,000.

LONDON, O.—Cluster lighting on Main Street, including the laying of cables and the purchase of standards and lamps, will be paid for by a bond issue of $2,500 which has been authorized by the Council.

QUINCY, O.—Plans to install an electric lighting plant are being considered by the City Council.

SALEM, O.—Showers & Taylor, of Zanesville, have the contracts for the erection of the new addition to the Salem Light Company's plant here at their bid of $14,000.

SPRINGFIELD, O.—The city authorities have entered into a contract with the Springfield Light, Heat & Power Company for street lighting, under arrangements which contemplate the installation of several hundred ornamental cluster lights, including 175 250-candlepower Mazda lamps and 392 600-candlepower Mazda lamps, which are to be placed within four months.

WEST MILTON, O.—The Stillwater Valley Electric Light Plant, L. A. Pearson, owner, is planning to extend its transmission lines.

ELWOOD, IND.—The City Council has granted a ten-year contract to the Indiana General Service Company, of Elwood, for 150 arc lamps and a number of incandescent lamps.

ERIGHTON, ILL. — The Council has granted a franchise to Arthur Farrell to furnish energy for light and power.

GALENA, ILL.—The Union Electric Company, of Dubuque, Iowa, has closed a contract with the Interstate Light & Power Company, of Galena, Ill., to furnish electric energy for both light and power in the mining district of Southwestern Wisconsin, which includes, among others, the towns of Platteville, Benton, Cuba City and Hazel Green. The Union Electric Company will span the Mississippi River with a transmission line, to be 2,200 feet in length and supported on steel towers.

HARDIN, ILL.—Peter A. Gotway has petitioned for a franchise to establish an electric lighting plant here.

HUME, ILL.—Mayor J. M. Lewis will present to the Town Board a proposition to purchase a municipal electric lighting plant.

OLNEY, ILL.—City officials here are considering a proposition to erect a municipal electric lighting plant.

SALEM, ILL.—The City Council has accepted the proposal of the Varney Electric Company, of Evansville, Ind., to install new equipment at the electric lighting plant.

SPRINGFIELD, ILL.—A contract for electrical equipment has been awarded by the City Commission to the General Electric Company, of Chicago, as follows: potential transformers, street light panels and substation panels, $2,560; pendant units, $5,452.

SPRING VALLEY, ILL.—The Spring Valley Utilities Company, R. W. Brown, manager, is planning to build 15 miles of transmission line and install three 200-kilowatt transformers.

GREENVILLE, MICH.—A petition is being circulated here to bring before the voters at the spring election the question of installing a boulevard lighting system on the main streets here.

HASTINGS, MICH.—The Thornapple Gas & Electric Company, L. W. Heath, manager, is planning to install additional generating equipment, and to extend its transmission lines to Vermontville, where a new lighting system will be installed.

JANESVILLE, WIS.—The east side head gates and wing wall of the Fulton power plant, owned by the Janesville Electric Company, have been washed out as the result of the undermining of the cement walls during the high water some time ago. The plant will be out of commission for two months.

MANITOWOC, WIS.—The utility committee of the Common Council has recommended that the city advertise for bids

immediately for the new electrical equipment for the electric power and light plant. J. J. Kelly is city clerk.

NORTH MILWAUKEE, WIS.—Construction of an electric distribution and transmission line between North Milwaukee and Granville is contemplated by the North Milwaukee Light & Power Company, a branch of The Milwaukee Electric Railway & Power Company, of which S. B. Way is president.

OOSTBURG, WIS.—The Oostburg Light, Heat & Power Company has been organized with a capital of $10,000 by H. W. LeMahieu, L. LeMahieu and John Borthouwer, for the purpose of supplying this city with electrical energy for light and power.

VIOLA, WIS.—A proposition to purchase an electric lighting plant will be placed before the voters at the spring election.

FARIBAULT, MINN.—Northern States Power Company, Faribault division, has secured a five-year contract with the Faribault Packing & Provision Company covering electrical power for the operation of their new plant which is being erected here. The power load will be approximately 360 horsepower which includes 100 horsepower for the operation of a 165-ton refrigerating plant. It is estimated that the revenue to the power company will be from $500 to $750 per month.

JACKSON, MINN.—This city has voted $30,000 in bonds for extensions and improvements to the municipal power plant and lighting system.

MILAN, MINN.—The Milan Light & Power Company is planning to install an additional 25-horsepower generating unit.

GRINNELL, IOWA.—The Iowa Light, Heat & Power Company of Grinnell has incorporated with a capitalization of $1,000,000. Lindsey Hooper is president and Charles A. Olson is secretary-treasurer of the company.

OXFORD JUNCTION, IOWA.—The Electric Light Company, of this place, Walter Coon, manager, is planning to supply all the small towns between Cedar Rapids and Clinton with electric light and power service.

TIFFIN, IOWA.—Citizens here have voted to install an electric distribution system in this city and secure energy from Iowa Lighting & Power Company, of Cedar Rapids.

POPLAR BLUFF, MO.—Sealed proposals will be received until April 17 for furnishing electrical supplies, line materials, etc., to be used by the municipal electric light and power plant. H. H. Wilcox, city clerk.

BUHLER, KANS.—A special election will be held this week to vote $5,000 bonds for a street lighting system. Service will be secured from either the Kansas Gas & Electric Company, Wichita, or the United Water, Gas & Electric Company, Hutchinson. Both companies have submitted propositions, and if that of the Hutchinson Company is accepted the transmission lines will be extended from Buhler to Inman, where electric service is also desired.

EASTON, KANS.—At the spring election a proposition to establish a municipal power plant will be considered by the voters.

PRESTON, KANS.—This city has voted bonds to secure an electric lighting system. It is proposed to build a transmission line and purchase energy, rather than construct a municipal plant.

FULLERTON, NEB.—Fire recently destroyed the plant of the Fullerton Electric Light & Power Company, valued at $20,000. Preparations to rebuild are being made.

HOLDREDGE, NEB.—The Intermountain Railway, Light & Power, which is building transmission lines to Funk, Wilcox and Hildreth, expects to have the work completed this month.

SYRACUSE, NEB.—Plans are being considered for the installation of a municipal electric lighting plant.

VALLEY, NEB.—A proposition to dispose of the municipal electric lighting plant and to buy electrical energy from other sources is receiving the attention of voters here.

PIERRE, S. D.—Action looking toward the ultimate development of power at Big Bend in the Missouri River, several miles below this city, is contemplated in the articles of incorporation filed here for the Missouri River Power Company with headquarters at Pierre, and a capital of $1,000,000. The incorporators are J. E. Mallery, Doane Robinson and Harry Quackenbush, of Pierre. The plan is included in a bill introduced in the South Dakota legislature. The bill attempts to meet the conditions regarding rights of private companies in the development of power. This action puts the Missouri River Power Company in a position to take up the work if conditions are favorable.

LEAD, S. D.—The City Commissioners have taken preliminary steps toward providing this city with a municipal lighting system.

WESTHOPE, N. D.—C. M. Condit has been granted a franchise to erect and maintain electric transmission lines and equipment in this city for a period of 20 years.

DATES AHEAD.

Railway Signal Association. Annual convention, Chicago, Ill., March 20 and 21. Secretary, C. C. Rosenberg, Times Building, Bethlehem, Pa.

Minnesota Electrical Association. Annual convention, Minneapolis, Minn., March 21 and 22. Secretary, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

American Society of Mechanical Engineers, Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington. D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

National Electric Light Association. Annual convention, Chicago, Ill. May 22-26. Secretary T. C. Martin, 29 West Thirty-ninth Street, New York City.

Arkansas Association of Public Utility Operators. Annual convention. Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

FRANKFORT, KY.—The city of Frankfort has received $32,000 in government bonds, and other considerations from the Kentucky Utilities Company, in return for which the city relinquishes a first lien on the property of the company. It is proposed that the $32,000 be set aside as the nucleus of a fund with which the city later may construct a municipal lighting plant.

HICKMAN, KY.—Stanwood, Taylor & Company, of Chicago, operating under the corporate name of the Kentucky Light & Power Company, has purchased from the Public Service Company of Western Kentucky, the electric light and power plant at Hickman. The same property, though since improved, had been purchased from local owners three years before by the Western Kentucky corporation. It will be continued under the present management, with Doyle Jurney as general manager.

PADUCAH, KY.—The Home Electric Company, of Paducah, is slated to be the purchaser of an electric lighting franchise which the Fiscal Court of McCracken County will sell in April. This will provide for establishment of a plant and service to the community of Lone Oak, Ky.

PRESTONSBURG, KY.—The Prestonsburg Electric Light Company has increased its capital stock from $10,000 to $25,000. Service extensions probably will be made.

CHATTANOOGA, TENN.—The Park Commission will install a new lighting system in Eastland Park.

FRIENDSHIP, TENN.—W. H. Sudbury has sold the local electric lighting plant to Pony Fisher, of Crockett Mills.

NASHVILLE, TENN.—Incorporators of the Nashville, Hartsville & Red Boiling Railroad, to run from Hartsville to Red Boiling Springs, have not decided whether this will be a steam or electric line. J. C. Shofner, Perkins Baxter and others, of Nashville, are interested.

BIRMINGHAM, ALA.—The Alabama Power Company has completed arrangements whereby sufficient funds are at its disposal for improvements in this district during the next ten years. The company plans enormous developments in the near future. Another power unit at Lock 12 on the Coosa River is contemplated immediately, this new unit to furnish 17,500 horsepower. Another improvement will be the erection of piers and cranes where the Louisville & Nashville Railroad crosses the Coosa, above the dam. This will enable the company to handle the heaviest machinery, and will entail an expenditure of $750,000. This work will be under contract shortly, with completion probable in November. The Alabama Power Company also contemplates in the near future the erection of a steam electric plant on the Warrior River. This enormous expenditure will be undertaken to furnish an emergency station as a safeguard against possible droughts, lowering the waters of the Coosa. The steam power plant will be built in the coal regions, and the company may buy coal properties to add to its holdings.

M'COMB, MISS.—The announcement has been made that the Magnolia & McComb Electric Lighting & Railway Company will be in operation within six months. Guy M. Walker of New York, who recently purchased the McComb City Electric Light & Power Company, is here arranging for the proposed improvements.

LITTLE ROCK, ARK.—W. N. Kindrick has made recommendations in the City Council for addjtional street lights in the Fifth Ward.

LITTLE ROCK, ARK.—George B. Blanchard, of Chicago, promoter of the recently organized Hot Springs, Pine Bluff & Mississippi Railroad, with a capital of $5,000,000, states that it will be either electric or gasoline-operated.

NEWPORT, ARK.—The Arkansas Light & Power Company has filed a mortgage of $5,000,000 thirty-year gold bonds given to the Guaranty Trust Company, of Newport. The funds thus secured are to be used in the purchase of electric lighting plants in Arkansas and the construction and improvement of others. The Newport plant, it is understood, will be enlarged.

ALLEN, OKLA.—P. L. Linebaugh, of Duncan, has made application to the City Council for a franchise to install a power plant and furnish electric service in Allen.

COYLE, OKLA.—The city contemplates building an electric lighting and power plant.

FOSS, OKLA.—Line improvements are contemplated by H. D. Cobb, superintendent of the municipal electric lighting plant.

FT. COBB, OKLA.——The city is planning to construct an electric lighting plant and water works system.

BEEVILLE, TEX.—The Texas Southern Electric Company of this city purchased city property and will erect a modern electric lighting and power plant at an early date.

BELTON, TEX.—The Texas Power & Lighting Company, of Dallas, plans to reconstruct the municipal lighting system here.

CLEBURNE, TEX.—The Cleburne Traction Company has been incorporated here with a capital stock of $15,000, for the purpose of operating an electric street railway and a generating plant for power and lighting purposes.

COMMERCE, TEX.—Arrangements have been completed by the Texas Power & Light Company to extend its transmission line, now being built from Jenkins to Royse City, to Commerce, connecting here with the present transmission line which connects Paris, Bonham, Honey Grove, Ladonia and other towns. This will connect the Paris-Bonham-Commerce district with the Central Texas transmission lines of the company and make available an almost unlimited supply of electrical energy. The line will operate at 33,000 volts.

DALLAS, TEX.—The Texas Light & Power Company has authorized the sale of $200,000 bonds, the proceeds to be used in paying for improvements to its power transmission system.

GUNTER, TEX.—The Gunter Power & Light Company has arranged to install an electric light plant here in the near future.

MARLIN, TEX.—C. C. Moser, of Dallas, and associates are promoting the construction of an interurban electric railway between Marlin and Waco, a distance of about 55 miles.

RIO GRANDE, TEX.—C. Valle & Brothers will construct an electric lighting plant here.

SAN ANTONIO, TEX.—The San Antonio Gas & Electric Company, subsidiary of the American Light & Traction Company of New York, will install additional equipment in its electric light and power plant at a cost of about $150,000.

WESTERN STATES.

COKEVILLE, WYO.—At a meeting of the Town Council a 50-year electric light and power franchise was granted to W. F. Pitt, of Kemmerer, Wyo.

ALAMOGORDO, N. M.—The City Council has entered into a tentative contract to purchase the properties of the Alamogordo Light & Power Company, the Alamogordo Water Works Company and the Alamogordo Improvement Company for a total consideration of $300,000. The contract will be submitted for ratification of the voters on April 4. If it is approved improvements will be made to the plants.

CARLSBAD, N. M.—The Public Utilities Company will install new equipment in its electric power and light plant here.

PRESCOTT, ARIZ.—Plans are under way for the installation of another electric plant at Verde River to develop 8,000 horsepower to be transmitted 70 miles by distribution lines to Gila County mining camps.

SPRINGVILLE, UTAH.—The city of Springville is planning to enlarge its municipal light and power plant, application having been made at the office of State Engineer W. D. Beers for rights to ten cubic feet per second on Little Spring Creek. The municipality expects to develop 300 additional horsepower. Application of Junius J. Hayes of Kanab for nine cubic feet per second from the east fork of the Rio Virgin River was also filed with the State Engineer. The application is for a power plant that will develop 200 horsepower.

RENO, NEV.—City officials and the Reno Power, Light & Water Company have agreed upon plans for the installation of an electrolier lighting system to cost about $5,000.

OAKVILLE, WASH.—It is reported that the City Council contemplates purchasing the local electric lighting plant from Frank Leisner, extending and improving same and operating it as a municipal utility.

TACOMA, WASH.—The City Council is considering petitions for the installation of ornamental lights in various parts of the city as follows: the Park Board has petitioned the Council for new light standards in Wright Park and Point Defiance Park; property owners along South Ainsworth Street have petitioned for ornamental lights on Ainsworth Street from Steele to South Sixteenth Street; South Seventeenth Street on the corners of M and K Streets.

ASTORIA, ORE.—Judge T. S. Cornelius of the Clatsop County Court reports the court will install a 50-horsepower motor, a centrifugal pump and electric drill and equipment in its rock-crushing plant at Tongue Point, near Astoria.

EUGENE, ORE.—An ordinance providing for the installation of ornamental lights on Stevens Street has been passed by the City Council, and it is reported bids for materials and installation of the system will be received at an early date.

MEDFORD, ORE.—The stockholders of the California-Oregon Power Company, of Medford, have assessed themselves $3.30 per share on outstanding stock, while the bondholders have co-operated by waiving interest on bonds outstanding for five years, in order to secure funds for immediate construction work, which includes the completion of the great power project at Capco, Ore., on the Klamath River; the doubling of the capacity of the Prospect Power plant, and extension of power lines to mining and timber regions. According to J. D. Grant, of San Francisco, president of the company, this method of financing new construction was deemed preferable to a new bond issue, which would increase the interest charges on the company. Mr. Grant states in addition to bonds deposited to secure borrowed money, there are $3,200,000 first and refunding bonds outstanding. The company is paying interest on $1,200,000 underlying bonds and on its floating debt, and is earning enough to pay interest on the first and refunding bonds. Other officers of the company are John D. McKee, Medford, vice-president, and J. P. Churchill, Yreka, Cal., second vice-president.

MYRTLE CREEK, ORE.—Initial steps have been taken by the City Council toward securing better light and water service by the employment of engineers to report on the probable installation of a power project in the South Umpqua River near the mouth of Myrtle Creek.

NORTH BEND, ORE.—About $5,000 damage was done the power plant of the Oregon Power Company here in a recent fire. Manager Jennings states repairs will be made at once.

ROSEBURG, ORE.—John Kiernan, a Portland capitalist, has purchased the interest of A. Welch in the Douglas County Water & Light Company, of Roseburg. Mr. Welch's interests also included half of the stock of the Seaside Light & Power Company. The Douglas Water & Light Company has a capitalization of $600,000. Mr. Kiernan reports additions and extensive improvements will be made at the Roseburg plant.

ANAHEIM, CAL.—The Southern California Edison Company has been awarded the contract for furnishing electric current for the municipal power plant, the minimum amount to be used each month being placed at 31,666 kilowatts, at a cost of $400.

LOS ANGELES, CAL.—The matter of having a transmission line for aqueduct power extended to the harbor district will soon be presented to the power bureau by the Harbor Commission.

LOS ANGELES, CAL.—The City Council has adopted the report of the Board of Public Works with reference to ornamental lights on certain streets, and an ordinance will be prepared.

PORTERVILLE, CAL.—Upwards of 100 men are being employed in this district on construction work for the Mount Whitney Power & Electric Company. At present they are replacing the present main lines from Exeter south to Porterville with equipment better adapted to the heavier loads which have become necessary through a steady increase in business. Considerable work is to be done in Porterville in connection with the new substation under construction on the company's property in Puttman Avenue, which is being built at a cost of $40,000.

SANTA MARIA, CAL.—The Midland Counties Public Service Corporation reports having completed arrangements for the transfer of its local power station to Betteravia, where it is proposed to spend $175,000 in buildings and machinery for the plant. The reason given for this change of location is that a large contract has been obtained from the Union Sugar Company for light and power to be furnished by the electric company.

Proposals

FUSES.—Sealed proposals will be received until March 21 for furnishing and delivering electric fuses, f. o. b. municipal warehouse, Thirty-first Street and Sacramento Avenue, Chicago, Ill., according to plans and specifications on file in the office of the Department of Public Works, Room 406 City Hall. W. R. Moorhouse, Commissioner of Public Works.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9380—Great Lakes, Ill., one Roentgen-ray machine. Schedule 9398—Brooklyn, N. Y., 20 120-volt electric heaters. Schedule 9405—Norfolk, Va., eight five-kilowatt, radio motor-generators; eight automatic, contactor-type panels; 14 radio transformers. Bidders desiring to submit proposals should make application for schedules to the Bureau or Purchasing Office nearest to navy yard where delivery is to be made.

Financial Notes

Negotiations have been completed by Borton & Borton, of Cleveland, O., and J. R. Woodhull & Company, of Dayton, O., for the purchase from an eastern banking house of its holdings of preferred stock of the Dayton Power & Light Company, which was recently issued to finance extensions during 1915. The stock will be sold by the brokers in Ohio.

At a meeting of the board of trustees of the Northwestern Electric Company, Portland, Ore., a quarterly dividend of $1.50 per share was declared, payable April 1, 1916, on preferred shares of stock outstanding as of record at close of business March 24, 1916, said dividend being at the rate of 6 per cent per annum. Until further notice preferred stock dividends will be paid quarterly instead of semi-annually.

The San Diego (Cal.) Consolidated Gas & Electric Company has applied to the State Railroad Commission for authority to increase its capital stock from $3,500,000 to $6,000,000, and to issue and sell $500,000 of its preferred stock. The proceeds are to refund $56,000, par value, of 6-per-cent debenture bonds and reimburse the company for expenditures from its income for additions and betterments to its service, totaling $115,564. The company serves about 600 square miles of territory.

In a recommendation to the City Council of Tacoma, Wash., Charles D. Atkins, Commissioner of Finance, urges that the City of Tacoma invest a part of the light and power reserve fund in city bonds, which have been offered by the present owners to the city. The bonds, which mature in 1932, are for the new Eleventh Street bridge, of which $475,000 has been issued. The reserve fund has more than $100,000 idle. The bonds offered have a par value of $50,000, and bear 4.5 per cent interest.

The New Jersey Power & Light Company has sold to N. W. Halsey & Company, New York City, $550,000 first-mortgage 5-per-cent bonds due in 1936. The company was organized in December, 1915, as a subsidiary of General Gas & Electric Company and supplies electric current for light and power in nineteen communities in Morris and Somerset Counties, New Jersey, being properties formerly operated by Eastern Pennsylvania Power Company and affiliated corporations. Plans are underway by the company to erect a new central generating station near Dover with an initial installation of 3,500 kilowatts. The new station will take the place of the present stations at Dover, Rockaway and Bernardsville, which will be held as reserve stations.

Dividends.

	Term.	Rate.	Payable
Am. Pub. Util. pf.	Q	1.5 %	Apr. 1
Bell Tel. of Canada	Q	2 %	Apr. 15
Buffalo Gen. Elec. com.	Q	1.5 %	Mar. 31
Cent. States Elec. Corp. pf.	Q	1.75%	Apr. 1
Duluth Edison, pf.	Q	1.5 %	Apr. 1
Interborough Rap. Tran.	Q	5	Apr. 1
Montreal Tramways	S	2.5 %	Apr. 1
Springfield Ry. & Lt. pf.	Q	1.75%	Apr. 1
United Gas Imp.	Q	2 %	Apr. 15
West Penn Rys. pf.	Q	1.25%	May 1
West Penn. Trac. pf.	Q	1.5 %	Apr. 15
West Penn. Trac. extra	—	0.5 %	Apr. 15

Reports of Earnings.

GENERAL GAS & ELECTRIC COMPANY AND SUBSIDIARIES.

Earnings for the seven months ended January 31:

Gross operating revenues	$1,526,773.14
Operating expenses and taxes	978,976.27
Operating income	547,796.87
Miscellaneous income	6,697.47
Gross income	554,494.34
Deductions from income	291,497.60
Dividends	77,083.33
Balance after deductions	58,737.87

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 13	Mar. 6
American Tel. & Tel. (New York)	128⅜	127⅜
Commonwealth Edison (Chicago)	143	143
Edison Electric Illuminating (Boston)	245	246
Electric Storage Battery common (Philadelphia)	63⅛	63⅛
Electric Storage Battery preferred (Philadelphia)	63⅛	63⅛
General Electric (New York)	169	166½
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	7	6½
Massachusetts Electric preferred (Boston)	37	36
National Carbon common (Chicago)	—	—
National Carbon preferred (Chicago)	122	122
New England Telephone (Boston)	136	135¾
Philadelphia Electric (Philadelphia)	27¼	27¼
Postal Telegraph and Cables common (New York)	78	80
Postal Telegraph and Cables preferred (New York)	66⅞	67¾
Western Union (New York)	89¼	88
Westinghouse common (New York)	65	62
Westinghouse preferred (New York)	75	75

New Incorporations

MILWAKEE, WIS.—Ruess & Beyer Electric Company. Capital, $5,000. Incorporators: O. J. Ruess, John Beyer and others.

EAST ST. LOUIS, ILL.—Saunders Motor Power Company. Capital $10,000. Incorporators: Roy Saunders, J. N. Keys and R. B. Logan.

INDIANAPOLIS, IND.—Everett-Buschmann Company. Power plant specialties. Incorporators: W. J. Everett, O. L. Buschmann and others.

CHICAGO, ILL.—Toto Electric Manufacturing Company. Capital, $5,000. Incorporators: G. H. Powell, A. B. Clements and E. O. Eakin.

WESTBORO, MASS.—Goddard Spark Plug Company. President, A. H. Goddard; secretary, A. R. Cummings; treasurer, L. E. Thurber.

BIRMINGHAM, ALA.—Southern States Electric Company. Capital, $12,000. Incorporators: W. E. Mitchell, V. H. Hanson and F. W. Hansman.

MEMPHIS, TENN.—Memphis Armature Works. Capital, $10,000. General electrical business. Incorporators: S. J. Swanson, John Deeth, J. W. Marshall and others.

WORCESTER, MASS.—Franklin Square Electric Company. Capital, $5,000. Electric fixtures and supplies. Incorporators: W. R. McLaughlin, A. W. Wilson and E. F. Coghlin.

DOVER, ILL.—Best Electric Company has been incorporated in Delaware with a capital of $10,000 to manufacture electric lamp sockets and lighting appliances. Incorporators: F. R. Hansell, Philadelphia, Pa., G. H. B. Martin and S. C. Seymour, Camden, N. J.

New Publication

BULLETIN OF BUREAU OF STANDARDS.—No. 3, Vol. XII, of the *Bulletin of the Bureau of Standards*, contains the following articles: "Calculation of the Maximum Force Between Two Coaxial Circular Currents," by Frederick W. Grover; "Construction of Primary Mercurial Resistance Standards," by F. A. Wolff, M. P. Shoemaker and C. A. Briggs; "Note on the Resistance of Radiotelegraphic Antennas," by L. W. Austin; "A Method of Measuring Earth Resistivity," by Frank Wenner; "A New Relation Derived from Planck's Law," by Paul D. Foote.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20,288. ELECTRICAL EQUIPMENT.—A firm in Japan writes that it desires to receive catalogs and cash quotations from American manufacturers of electrical equipment and supplies.

NO. 20,302. ELECTRICAL SUPPLIES.—An American consular officer in Italy reports that a man in his district desires to represent American manufacturers and exporters of electrical supplies. Correspondence should be in Italian.

An inquiry has been received by Pass & Seymour, Syracuse, N. Y., from P. H. Nugent, Bridge Street, Bantry, Ireland, which states that he wishes to be placed in communication with manufacturers of a general line of accessories such as switches, ceiling rosettes, cutouts, metallic filament lamps and small house-service meters.

Electrical Patents Issued March 7, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,174,044. **X-Ray Apparatus.** E. Benson, Newton Highlands, Mass. Structure of cathode.

1,174,053. **Inductance Regulator for Alternating-Current Circuits.** M. Burns, Evansville, Ind., assignor of three-tenths to Smith Wiltshire, three-tenths to C. T. Curry, and one-tenth to F. Elmendorf, Evansville, Ind. Mechanism for adjusting core sections.

1,174,072. **Gear Case.** G. H. Hurteau, assignor to Electric Service Supplies Co., Philadelphia, Pa. For motor gears and the like; plates spot welded and riveted together.

1,174,078. **Cable Terminal Box.** J. A. McCoy, Somerville, Mass. Cable entry into box having outer casing and inner distributing casings.

1,174,104. **Dynamo Machine and Apparatus.** W. A. Turbayne, Lancaster, N. Y., assignor to Gould Storage Battery Co. Reversible booster.

1,174,105. **Electropneumatic Brake.** W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Has electrically controlled valve for venting fluid from brake pipe.

1,174,125. **Electrical Burglar-Alarm.** F. E. Crawford, assignor to Bankers Electric Protective Association, Boston, Mass. Time-controlled door-alarm circuit.

1,174,129. **Annunciator.** F. J. Dougherty, Camden, N. J. Details of electromagnet and drop.

1,174,142. **Door-Controlled Circuit-Breaker.** H. Harris, Buffalo, N. Y. Details of door-operated contact device.

1,174,145. **Igniter.** A. B. Herrick, assignor to M. C. Messler, Pawtucket, R. I. Combined spark plug and induction coil.

1,174,146. **Electric Miner's Lamp.** W. Hickman, assignor to Chemische Fabrik Griesheim Electron, Frankfort-on-the-Main, Germany. Relates to battery-cell selection and arrangement for operating.

1,174,157. **Electric Spark Device.** J. A. Jeffery and B. A. Jeffery, Newark, N. J. Details of spark plug.

1,174,158. **Electric Ignition Device.** J. A. Jeffery and B. A. Jeffery. Spark-plug structure.

1,174,162. **Electrical Switch.** M. H. Johnson, Utica, N. Y. Details of pivoted contact device.

1,174,179. **Water Bottle, Stopper and Heating Attachment.** C. A. Rickards, assignor to A. Schrader's Son, New York, N. Y. Electric heater for hot-water bottle inserted through stopper.

1,174,181. **Electric Telegraph Messenger Call Recorder.** J. M. Roberts, Norfolk, Va. Makes signal marks in dust which is brushed away to erase.

1,174,187. **Loading Coil.** T. Shaw, assignor to American Telephone & Telegraph Co., New York, N. Y. For telephone lines.

1,174,188. **Hygroscopic-Actuated Circuit-Closer.** C. H. Smith, Jr., Atlanta, Ga. Contact member swings under varying humidifying atmospheric conditions.

1,174,200. **Inspecting Instrument.** O. F. Tallman, assignor to W. N. Mathews & Brother, St. Louis, Mo. For testing for faults in cables, etc.

1,174,201. **Advertising Device.** G. L. Thom, assignor to George Madison Co., New York, N. Y. In form of lamp shade.

1,174,202. **Display Stand.** G. L. Thom, assignor to George Madison Co. Sectional advertisement bearing members arranged about a lamp.

1,174,223. **Electric Channeling Machine.** A. Ball, assignor to Sullivan Machinery Co., Boston, Mass. For quarrying.

1,174,225. **Spark-Coil.** D. M. Bliss, assignor to Thomas A. Edison, West Orange, N. J. Assembly of core, coil and casing.

1,174,229. **Railway Signaling System.** C. W. Coleman, assignor to Hall Switch & Signal Co., New York, N. Y. Employs pulsating current and selects by frequency.

1,174,230. **Relay.** C. W. Coleman, assignor to Hall Switch & Signal Co. Polarized armatures vibratory in synchronism with current-control switch.

1,174,233. **Locking-Socket for Electric-Lamps.** T. Deaderick, Nashville, Tenn. Key-controlled cam locks base in shell.

1,174,236. **Controlling System.** A. F. Dixon, assignor to Western Electric Co., New York, N. Y. System for controlling perforated transmitter tape.

1,174,240. **Lighting System.** C. F. Dussaud, assignor to Societe Internationale, de Lumiere Froide, Paris, France. Series of movable lights flashed at given point give appearance of fixed lamp and each lamp can cool betwen lightings.

1,174,246. **Support for Electrical Distribution Devices.** J. L. Fay, assignor to W. N. Mathews & Brother, St. Louis, Mo. Pole mounting of cross-arm and fuse boxes.

1,174,252. **Electric Heating Element.** A. H. Happe and W. J. Keep, assignors to the Michigan Stove Co., Detroit, Mich. Mounting in flat case of resistance ribbon on core.

1,174,262. **Telephone System.** E. H. Martin, Webster City, Iowa, and T. H. Ferguson, Oak Park, Ill. Relates to operator's signal control.

1,174,281. **Telegraph System.** P. M. Rainey, assignor to Western Electric Co., New York, N. Y. Central system with automatic operator selection.

1,174,287. **Insulator-Support.** M. C. Rosenfield, Cleveland, O. Structure and securing of hollow post or pin.

1,174,288. **Clamping Device.** M. C. Rosenfield. For securing conductors.

1,174,293. **Controller.** J. E. Seely, assignor to Vulcan Coil Co., Los Angeles, Cal. Rotary drum resistance controller.

1,174,337. **Integrating Mechanism.** E. H. Messiter, assignor to Electric Weighing Co., New York, N. Y. Continuous weighing mechanism; has meter in circuit controlled by load and speed of load conveyer.

1,174,338. **Regulation of Dynamo-Electric Machines.** A. H. Midgley, and C. A. Vandervell, Action Vale, England. Direct-current machine has field regulator controlled by pulsating current from armature.

1,174,352. **Combined Starting and Safety Device.** G. C. Richards, Berkeley, Cal., assignor of one-half to H. C. Austin, Oakland, Cal. Starting motor switch interlocked with clutch to engine.

1,174,367. **Ship's Electric Range.** F. M. Vogel, assignor to General Electric Co., Schenectady, N. Y. Hinged heater units connected to buses beneath by flexible connections.

1,174,373. **Motor Regulation.** E. A. Wright, Norwood, O., assignor to Allis-Chalmers Mfg. Co. Variable speed induction motor with variable load has speed maintained constant below synchronism by secondary regulation and direct-coupled direct-current machine.

1,174,377. **Combination Lamp Protector and Color Cap.** E. G. Appleton, Burlington, Iowa. Of transparent, springy material for snapping over bulb.

1,174,378. **Detachable Plug.** W. S. Bacon, San Diego, Cal., assignor of one-half to O. Kessler. Has push-button-operated collapsible shell.

1,174,379. **Swivel Connection for Electric Conductors.** W. S. Bacon, assignor of one-half to O. Kessler. Has ball bearings.

1,174,383. **Crossing Signal.** L. S. Brach, New York, N. Y. Means for simulating movement of manually swung lantern.

1,174,421. **Light Socket.** W. J. Howe and J. M. Pearring, San Diego, Cal. Locked lamp base requires breaking of fragile, transparent member to unlock.

1,174,427. **Apparatus for Forming Telegraph Tape.** C. L. Krum and H. L. Krum, assignors to Morkrum Co., Chicago, Ill. Key-controlled, magnet-operated.

1,174,434. **Telephone Pay-Station.** G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Coin-controlled, semi-automatic.

1,174,435. **Automatic Locomotive-Controlling Mechanism.** O. H. Naville, La Fayette, Ind. Electromagnetically operated throttle and brake valves.

1,174,443. **Electric Water Heater or Geyser.** J. R. Quain, London, Eng. Electric flash heater for attachment to pipe.

1,174,444. **Heater for Mining and for Other Purposes.** J. R. Quain. Cylindrical heating tool having resistor in casing with shoe at one end.

1,174,446. **Electric Metal-Working Apparatus.** A. F. Reitzel, assignor to Thomson Electric Welding Co., Lynn, Mass. Manner of applying upsetting pressure to the work.

1,174,450. **Track Relay for Block-Signal Systems.** J. J. Ruddick, assignor to United States Electric Signal Co., Boston, Mass. Interlocked magnetically operated switches.

1,174,451. **Automatic Train-Stop.** H. G. Sedgwick, assignor to The National Safety Appliance Co., Mill Valley, Cal. Comprises normally open and normally closed circuits so arranged that if one is ruptured the other will be.

1,174,466. **Process for Electrodeposition of Copper.** S. C. Babcock, Hamburg, and E. W. Hagmaier, Lackawanna, N. Y. Phenol sulphuric acid is added to copper sulphate bath.

1,174,470 and 1,174,471. **Illuminating Appliance.** A. W. Beuttell, Streatham, London, Eng. First patent: Special reflector and plate screen between which is straight filament lamp. Second patent: Special reflector combined with straight filament lamp.

1,174,478. Insulated Rail-Joint. F. B. Corey, Edgewood Park, Pa. Structure of insulation.

1,174,479. Light Projector for Motion-Picture Machines. J. Darby, assignor to F. B. Griffin and E. C. Wallace, New York, N. Y. Lamp adjustment.

1,174,484. Clamping Device for Electro-magnets. L. Ericson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Simple, compact structure for telephone switchboard use.

1,174,491. Automobile Signal. J. M. Glassmeyer, St. Louis, Mo. Electrically lighted direction-indicator.

1,174,492. Bell and Switch-Operating Means. J. G. Glover, Lachine, Can. Push button operates plunger, actuating pivoted switch, which is independently operated by two other push buttons.

1,174,493. Insulated Rail-Joint. L. Griffin, Yonkers, N. Y. Special arrangement of insulation and fish plates.

1,174,503. Automatic Fire-Alarm System. J. M. Johnson, Kansas City, Kan., assignor to The United States Automatic Fire Alarm Co. Controlled by thermostat.

1,174,504. Time-Controller for Electric Currents. J. Jones, assignor to Electric Pest Exterminator Co., St. Joseph, Mo. Variable frequency circuit closer associated with clock dial and operated by minute hand.

1,174,521. Electric Lantern. N. S. Richmond, assignor to Metal Specialties Mfg. Co., Chicago, Ill. For attachment to dry battery.

1,174,548. Electrical Element. F. J. Cook, assignor of one-half to J. E. Doyle and one-half to C. S. Britton, Cleveland, O. Resistor for rheostat or heater.

1,174,554. Thermic Telephone. O. Fischer, assignor to Nammlooze Vennootschap De Nederlandsche Thermo-Telephoon Maatschappij, Utrecht, Netherlands. Structure of heat-conductor carrier. (See cut.)

1,174,563. Dynamoelectric Machine. A. E. Glass and J. M. Downer, assignors to General Electric Co., Schenectady, N. Y. Structure of short circuiting end rings.

1,174,570. Resistance Device. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Tubular resistance unit.

1,174,571. Battery and Switch Casing. E. A. Hawthorne, Bridgeport, Conn. Manner of securing sectional casing.

1,174,573. Automatic Signaling Device. W. F. Hoefs, Milwaukee, Wis., assignor of one-half to A. Grosswitz, Milwaukee, Wis. Direction-indicator displayed by lamp lighting and motor-operated door opened; also audible signal.

1,174,599. Telephone Pay-Station. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Coin-controlled automatic-dial calling device.

1,174,600. Condenser. W. J. Murdock, Everett, Mass. Structure of dielectric in plate condenser.

1,174,607. Insulator Supporting-Pin. C. L. Pierce, Jr., Pittsburgh, Pa. Is integrally forged.

1,174,613. Contrivance for Transmitting Sound to Solid Sound Conductors. E. Ruhmer, Berlin, Germany. Telephone diaphragm connected with solid conductor through vibratory elastic member.

1,174,618. Spark-Plug and Method of Forming the Same. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Manner of securing specially formed insulator to nipple.

1,174,654. Alternating-Current Motor. S. R. Bergmand, assignor to General Electric Co., Schenectady, N. Y. Inductance of secondary winding varied in response to speed variation.

1,174,655. Support for Indirect or Semi-Indirect Lighting Fixtures. H. A. Bauer, Lansdowne, Pa. Bowl support.

1.174,658. Shade-Supporting Device. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Manner of securing shade to tubular socket enclosing support attached to ceiling.

1,174,667 and 1,174,668. Process of Fixing Nitrogen and Electric Furnace for Effecting the Same. J. E. Bucher, assignor to Nitrogen Products Co., Providence, R. I. First patent: Treatment in electric furnace having a resistor including a catalyzer of low resistivity. Second patent: Modification.

1,174,676. Vacuum Valve-Tube. E. W. Caldwell, New York, N. Y. Self-regulating.

1,174,678. Brake Mechanism. H. A. Carpenter and A. W. Warner, assignor to Riter-Conley Mfg. Co., Pittsburgh, Pa. Solenoid-operated disk brake for electric motors.

1,174,686. Refillable Fuse-Plug. J. G. Clemens, Buffalo, N. Y. Structural details.

1,174,691. Signaling Device. A. R. Calgin, New York, N. Y. Direction-indicator for automobiles.

1,174,694. Detachable Coupling for Electric Fixtures. J. M. Crucet and M. H. Goldsmith, New York, N. Y. Contacts engage when parts secured by bayonet joint.

1,174,706. Fastener for Telephone Transmitters. A. J. Gattermeier, California, Mo. Details of means for mounting.

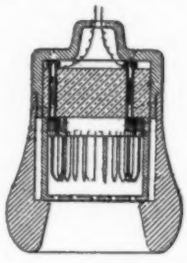
1,174,714. Heating System. G. E. Harrison and J. Templeton, Toronto, Can. Thermoelectric control of admission of steam to radiator.

1,174,715. Electrolytic Electricity Meter. H. S. Hatfield, assignor to General Electric Co., Schenectady, N. Y. Mercury device has provision for caring for air in dome of anode vessel when instrument tilted to restore mercury.

1,174,723. Submarine Torpedo-Discharging Device. H. W. Hills, assignor to L. Lavadan, New Orleans, La. For manipulating electrically controlled magnetic bomb.

1,174,726. Radiotelegraphy. C. Horton, New York, N. Y., assignor of one-tenth to A. M. Henry, Larchmont, N. Y. Sectional primary and secondary coils are relatively adjustable.

1,174,742. Ignition and Charging System. S. L. Lebby, Charleston, S. C. Control of



No. 1,174,554.—Thermic Telephone.

battery-charging and discharging and engine-ignition circuits.

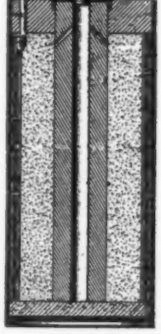
1,174,760. Controlling System for Conveying Means. A. C. Philpott, Bucyrus, Ohio. Main track and turn out for electrically operated carrier system.

1,174,772. System of Motor Control. M. Steiner, assignor to General Electric Co., Schenectady, N. Y. For reversible motors; comprises regulation by variation of generator voltage and field control.

1,174,793. Method of Frequency Transformation. E. F. W. Alexanderson, assignor to General Electric Co. Method of obtaining frequency harmonic to frequency of fundamental current by use of electric valve.

1,174,798. Galvanic Cell. V. G. Apple, Dayton, Ohio. Dry cell has granular material becoming depolarizer on adding liquid. (See cut.)

1,174,805. Train-Stopping Apparatus. J. H. Bennett, Boise, Idaho. Motor-operated



No. 1,174,793.—Galvanic Cell.

mechanism for operating motor switches and controller and engineer's brake valve.

1,174,809. Electric-Conduit Fitting. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. Structure of junction box.

1,174,810. Signaling Device. J. H. D. Blake, Le Mars, Iowa. Centrifugally controlled contact device.

1,174,812. Electromagnetic Piano. G. Breed, assignor to Lyrachord Co., New York, N. Y. Has auxiliary electromagnetic string vibrator.

1,174,813. Electromagnetic Musical Instrument. G. Breed, assignor to Lyrachord Co. Electromagnetically operated pulsator for vibrating strings, controlled at will of operator.

1,174,827. Circuit-Closer for Rain Signals. W. G. Conway, Hartford, Conn. Controlled by disruptible strip.

1,174,854. Railway Safety Device. W. F. Gray, Meridan, Miss. Mounting of dynamo on car truck.

1,174,881. Telephone Bracket. J. B. Ludlum, assignor to J. S. Ludlum, Marion, Ind. Extensible arm.

1,174,887. Magnetic Nail-Holding Device. G. L. Meriwether, Island Grove, Fla., assignor of one-half to V. R. Brice, Island Grove, Fla. Magnetic plates adapted to be secured to hand.

1,174,903. Process of the Treatment of Materials for Impregnating Them Electrosmotically. B. Schwerin, assignor to Elektro-Osmose, Aktiengesellschaft, Frankfort-on-the-Main, Germany. Process of purification of tanning extract and the dressing of hides.

1,174,911. Relay. N. H. Suren, Needham, Mass. Circuit closer having time control.

1,174,935. Railway Signal-Lamp Controller. W. K. Howe, assignor to General Railway Co., Gates, N. Y. For block-signal systems.

1,174,939. Absolute Permissive Automatic Block-Signal System. W. W. Salmon and E. L. Dodgson, assignors to General Railway Signal Co. Signal-circuit controlled by two closed track-circuits.

1,174,944. Molten Bath Process for Fixing Nitrogen and Means for Effecting the Same. J. E. Bucher, assignor to Nitrogen Products Co., Providence, R. I. Process of operating electric furnace to fix nitrogen.

1,174,946. Apparatus for Electro-Osmosis. H. Illig, assignor to Gesellschaft fur Elektro Osmos, M. B. H., Frankfort-on-the-Main, Germany. Structural details of anode, cathode, etc.

Reissue. 14,080. Trap. G. W. K. Fisher, Vancouver, Wash., assignor to Repeater Trap Co. Original No. 1,067,909, dated July 22, 1913. Electrically operated animal trap.

PATENTS EXPIRED.

The following United States electrical patents expired March 14, 1916:

620,900. Means for Lighting Fountains, etc. A. Englesmann, Stuttgart, Germany.

620,907. Trolley Ear. H. Geisenhoner, Schenectady, N. Y.

620,930. Circuit Breaker. T. J. Johnston, Schenectady, N. Y.

620,695. Alternating-Current Motor. E. W. Rice, Jr., Swampscott, and C. P. Steinmetz, Lynn, Mass.

620,966. Induction Motor. E. W. Rice, Jr., and C. P. Steinmentz, Schenectady, N. Y.

620,986. Freqency Changer. C. P. Steinmetz, Schenectady, N. Y.

620,987. Frequency Changer. C. P. Steinmetz, Schenectady, N. Y.

620,988. Self-Starting Alternating-Current Motor. C. P. Steinmetz and E. J. Berg, Schenectady, N. Y.

620,989. Starting Device for Electric Motors. C. P. Steinmetz and E. J. Berg, Schenectady, N. Y.

620,990. Frequency Changer. C. P. Steinmetz, Schenectady, N. Y.

620,996. Electric Arc-Lamp. J. T. Tsachieret, Leballois-Perrett, France.

620,998. Self-Setting Annunciator-Indicator. F. C. Van Dyck, Jr., New Brunswick, N. J.

621,001. Electrical Device Involving Hermetically Incased Conductors. N. G. Warth, Indianapolis, Ind.

621,005. Electric Meter. W. S. Weston, Chicago, Ill.

621,028. Electric Storage Cell. C. P. Elieson, London, England.

621,080. Underground Electric-Railway System and Travelling Collector Therefor. N. Henquin, Schenectady, N. Y.

621,084. Method of Applying Preservative Coatings to Objects or Structures of Iron or Steel. H. L. Hollis, Chicago, Ill.

621,093. Fire-Alarm Box. J. W. Johnson, Chicago, Ill.

621,104. Electric and Combined Electric and Gas Chandelier or Bracket. W. H. Lau, Chicago, Ill.

621,126. Electrical Switchboard Signal. W. E. McCormick, Chicago, Ill.

621,150. Process of Manufacturing Active Compositions for Secondary and Primary Battery Elements. A. Schanschieff, London, England.

622,205. Automatic System for Preventing Collisions on Electric Railways. C. F. Bancroft, Lowell, Mass.

621,210. Apparatus for Supporting Electric Wires and Automatically Cutting Off Current on Breakage of Same. R. Bostock, and F. A. Cheetham, Brighouse, England.

621,241. Electrical Controller. N. K. Garhart, Indianapolis, Ind.

621,263. Electric Switch. A. E. Maccoun, Braddock, Pa.

621,267. Magnetic Lifting Device. A. Monell, Homestead, Pa.

621,291. Electric Incandescent Lamp. F. M. F. Cazin, Hoboken, N. J.

621,292. Electric Incandescent Vacuum Lamp. F. M. F. Cazin, Hoboken, N. J.

Reissue 11,724. Electric Vehicle. K. Knudsen, Chicago, Ill.